THIS CHAPTER IMPLEMENTS STANAG 3570.

CHAPTER 6
DROP ZONES

The ground unit commander designates the drop zone, usually with the DZST leader's technical help. The drop zone is where drop aircraft deliver personnel and equipment by parachute or free drop. The commander selects a DZ location that best supports the tactical plan. In the case of tactical training, the commander checks the USAF assault zone availability report (AZAR) to see if an approved DZ already exists within the tactical area. If the AZAR does not include a DZ in that area, the commander must assess the tactical situation before choosing a DZ location.

Section I. SELECTION FACTORS

The commander uses the drop zone selection factors discussed in this section to analyze the suitability of a drop zone.

6-1. AIRDROP AIRSPEEDS

The speed of the aircraft determines how long the aircraft will remain over the drop zone. Table 6-1 provides the fixed-wing and rotary-wing airdrop speeds in knots indicated airspeed (KIAS).

TYPE OF AIRCRAFT	DROP SPEED
UH-1	50 to 70 knots (Best speed is 70 knots)
UH-60	65 to 75 knots (Best speed is 70 knots)
CH-46 (USMC)	80 knots
CH-47	80 to 110 knots (Best speed is 90 knots)
CH-53	90 to 110 knots
CH/HH3 (USAF)	70 to 90 knots
C-5/130/141/KC-130	130 to 135 knots (personnel)
C-5/130/141/KC-130	130 to 150 knots (Door bundles, CDS, and heavy equipment--best speed for all loads is 130 knots)
C130	140 knots (CDS)
C5/17/141/KG130	150 knots (CDS)

Table 6-1. Airdrop speeds.

6-2. DROP ALTITUDE

The DZ leader measures drop altitude (Table 6-2, page 6-2) from the highest point on the DZ (the highest field elevation) to the aircraft. In combat (wartime) operations, airborne and airlift commanders jointly determine drop altitudes.

a. Table 6-3, page 6-3, shows drop altitudes for different types of training missions. (For more information on drop altitudes, see AFI 11-231 and AFI 11-410.)

b. The aircraft altimeter displays altitude in feet above sea level, not in feet above the highest point on the ground. Thus, the pilot might request the drop altitude in "feet indicated," that is, the number that should appear on the altimeter at the time of the drop. You can calculate this simply by following this example:

(1) Obtain the drop altitude, that is, the distance in feet from the highest point on the drop zone (field elevation) to the desired altitude of the aircraft. In this example, drop altitude equals 800 feet (A, Table 6-2).

(2) Obtain the highest field elevation in feet above sea level. Round this number up to the nearest multiple of 50 (round 537 up to 550, for example) (B, Table 6-2). For purposes of obtaining the drop altitude in feet indicated, use this number for field elevation.

(3) Sum the two numbers you obtained to yield drop altitude in feet indicated (C, Table 6-2).

A	Distance from highest field elevation in DZ to aircraft, in feet.	800 Feet AGL
B	Highest point on DZ--highest field elevation in feet above sea level, round up to next 50, for example, round 505 up to 550.	+ 550 Feet Field Elevation
C	Drop altitude in feet indicated	1,350 Feet Indicated

Table 6-2. Example calculation of drop altitude in feet indicated.

6-3. ESTIMATION OF DROP ZONE TIME REQUIREMENT

For personnel, allow one second for each jumper after the first. For example, ten jumpers minus the first jumper equals nine jumpers. Multiply nine times one second. Allow nine seconds for all ten jumpers to get out the door. For equipment, allow three seconds for each door bundle after the first. For example, five bundles minus the first bundle equals four bundles. Multiply four times three seconds each. Allow twelve seconds to get the equipment out the door.

6-4. METHODS OF DELIVERY

When considering the method of delivery, pathfinders must take extra care during high-velocity airdrops or free drops around built-up areas or airfields. Either could damage buildings or airstrips.

a. **Low-Velocity Airdrop**. Pilots use a low-velocity airdrop for sensitive equipment and for personnel. The parachute slows the rate of the descent, allowing a soft landing.

b. **High-Velocity Airdrop**. Pilots use a high-velocity airdrop to deliver certain supply items. The load must be rigged in an airdrop container with an energy dissipater attached to its underside and a ring-slot parachute attached to the top. The chute stabilizes the load and reduces the rate of fall, ensuring an acceptable landing shock.

c. **Free Drop**. Pilots use free drop for nonsensitive items only. This type of load has no parachute to stabilize or slow its rate of descent.

PERSONNEL

Tactical Training	800 FT
Basic Airborne Trainees	1,250 FT
HALO (Minimum Opening)	2,500 FT
SATB/TTB (Use stand drop altitude of simulated load)	500 FT
Door bundles G13, G14 or T10	300 FT

CONTAINER DELIVERY SYSTEM

G-12D:	1 to 6 bundles, single parachute	400 FT
	7 or more bundles, single parachute	600 FT
	Cluster of 2 parachutes	600 FT
G-12/ 13E:	Single parachute	400 FT
	Cluster of 2	550 FT
G-13:	Single parachute or cluster of 2	400 FT
	Cluster of 3	500 FT
G-14:	Single parachute or cluster of 2	300 FT
	Cluster of 3	400 FT
12-Foot High Velocity		400 FT
26-Foot High Velocity		500 FT
SATB-C/TTB		See parachute load to be simulated

HEAVY EQUIPMENT

G-12D		650 FT
G-11A:	Single parachute	900 FT
	Cluster of 2 to 7	1,100 FT
	Cluster of 8	1,300 FT
G-11B:	Single parachute	700 FT
	Cluster of 2 to 4	750 FT
	Cluster of 5 to 7	1,100 FT
	Cluster of 8	1,300 FT
G-11C:	Cluster of 8	1,300 FT
SATB-H/TTB		See parachute load to be simulated.

NOTES:
1. Minimum drop altitude for heavy equipment using 5,000-pound parachute release system is 1,000 feet above ground level.
2. Combination drops will use the highest airdrop altitude.

ROTARY WING AERIAL DELIVERY

Personnel:	Day or night	1,500 FT
Bundles:	Day	300 FT
	Night	500 FT

Table 6-3. Aerial delivery altitudes.

d. **Added Risk**. When determining the suitability of the DZ and considering the method of delivery around built-up areas or airfields, the pilot also considers the added risk of damage to buildings when using high-velocity or free-drop methods.

6-5. OBSTACLES

To ensure a safe airdrop, and to make sure soldiers can recover and employ airdropped personnel and equipment, the pathfinders should clear the DZ and adjacent areas of all obstacles.

a. **Obstacles to Personnel**. This includes anything, natural or manmade, that could harm a parachutist.

b. **Obstacles to Equipment**. This includes anything, natural or manmade, that could hinder the recovery of equipment:

(1) ***Trees***. Trees 35 feet or higher, which would impede recovery of personnel or equipment.

(2) ***Water***. Water more than 4 feet deep within 1,000 meters of any edge of the drop zone presents an obstacle.

(3) ***Power Lines***. Any power lines that carry an active current of 50 volts or greater present a real and dangerous obstacle. Based on the reported altitude wind, pathfinders create a safety zone for parachutists by turning off all power within that zone. This helps prevent injuries. Figure 6-1 shows the recommended sizes of the safety zone for various altitude wind velocities during static line operations.

(4) ***Other***. Any other conditions, such as barbed wire fences, swamps, rocks, ditches, and gullies, that could injure parachutists or damage equipment.

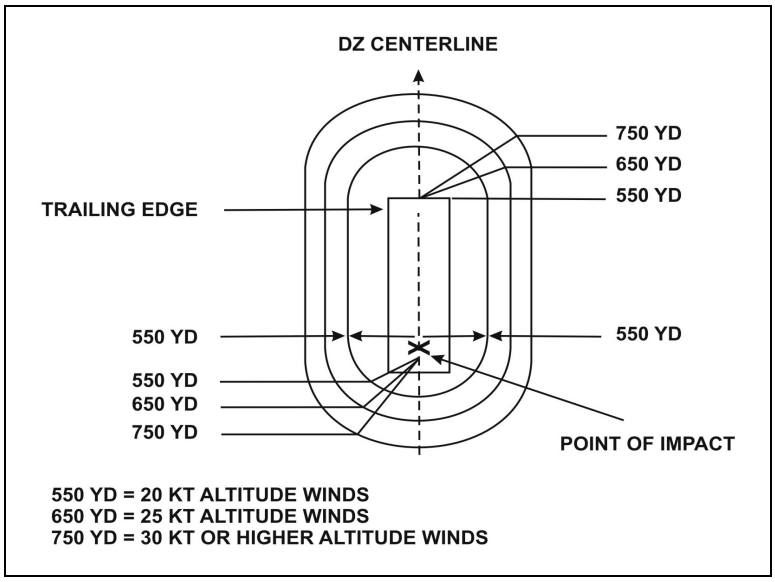


Figure 6-1. Recommended safety zones for high-tension lines.

6-6. ACCESS

Pathfinders should avoid any DZ that has a major obstacle between it and the objective area. Pathfinders should also make sure the area has adequate routes to conduct troop movement and to recover equipment.

6-7. SIZE

USAF doctrine determines the size of computed air release point DZs during peacetime drop operations.

a. **One Jumper**. The CARP DZ size for one jumper is at least 549 meters (600 yards) by 549 meters (600 yards). For each additional jumper, add 64 meters (75 yards) to the length of the DZ.

b. **Container Delivery System**. Table 6-4 shows the CARP DZ sizes for the container delivery system.

CDS (C-130)				
ALTITUDE (AGL) IN FEET	WIDTH	NUMBER OF CONTAINERS		LENGTH
		SINGLE	DOUBLE	
To 600	400 Yards	1	1 to 2	400 Yards
		2	3 to 4	450 Yards
		3	5 to 6	500 Yards
		4	7 to 8	550 Yards
		5 to 8	9 or more	700 Yards
Above 600	Add 40 yards to DZ width and length for each 100 feet above 600 feet (Add 20 yards to each side of the DZ).			
CDS (C-141)				
ALTITUDE (AGL) IN FEET	WIDTH	NUMBER OF CONTAINERS		LENGTH
		SINGLE	DOUBLE	
To 600	450 Yards	1	1 to 2	590 Yards
		2	3 to 4	615 Yards
		3	5 to 6	665 Yards
		4 to 8	7 to 16	765 Yards
		9 to 14	17 to 28	915 Yards
		15 to 20	29 to 40	1,065 Yards
Above 600	Add 40 yards to DZ width and length for each 100 feet above 600 feet. Add 20 yards to each side of the DZ.			

Table 6-4. Size criteria for tactical airlift drop zones, CDS.

c. **Personnel**. Table 6-5, page 6-7 shows the CARP DZ size for personnel. AFI 13-217, 1 Jun 99, provides additional size requirements.

d. **Heavy Equipment**. For this, make sure the CARP DZ size (Table 6-5, page 6-7) measures at least 600 yards (549 meters) wide by 1,000 yards (915 meters) long for one platform.

- C-130--add 366 meters (400 yards) to the length for each additional platform.
- C-141--add 458 meters (500 yards) to the length for each additional platform.

e. **More Than One Aircraft Outside Trail Formation**. In this situation, add 92 meters (100 yards) to the width of all CARP DZs (46 meters--50 yards--each side).

f. **Official Sunset to Sunrise**. During these times, add 100 yards (92 meters) to the length and width of all CARP DZs--50 yards (46 meters) each side and to each end.

NOTE:
- To convert yards to meters, multiply yards by 0.9144.
- To convert meters to yards, divide meters by 0.9144.

g. **Army VIRS Drop Zone**. For this, allow a minimum size of 300 yards by 300 yards (275 meters by 275 meters). To determine the required size of Army VIRS DZs, use the D=RT formula. For personnel jumps, allow a 100-meter buffer zone at the leading and trail edges of the DZ. If local regulations permit, the local commander can waive these buffer zones.

h. **Ground-Marking Release System Drop Zone.** Again, allow a minimum size of 300 yards by 300 yards (275 meters by 275 meters). Use the D=RT formula (Figure 6-2, page 6-8) to determine other size requirements. In the minimum size, include the 100-meter buffer (personnel drops only) at both the leading and trail edges of the DZ. (See Table 6-1, page 6-1, for airdrop speeds.)

i. **Parachutists or Bundles**. To calculate the number of either parachutists or bundles that a GMRS DZ of given length can accept in one pass, use the T = D/R formula (Figure 6-3, page 6-9). You must know the type of aircraft.

j. **Load Drift Under Parachute**. To calculate the amount of drift experienced by a load under a parachute, use the D = KAV formula (Figure 6-4, page 6-10). Always round up to the next whole number.

k. **Wind**. Measuring wind on the drop zone entails measuring both surface wind and mean effective wind.

(1) Use the AN/PMQ-3A, or any other acceptable wind measuring device, to measure surface (ground) wind speed, especially for personnel and heavy equipment operations.

(2) Mean effective wind (MEW) refers to the average wind from ground level to drop altitude. Measure the magnetic azimuth to the balloon and note the reciprocal heading. This gives you the MEW direction to report. Use the PILOT balloon (PIBAL) to measure MEW. PIBAL circumferences include--
- 10 grams for day--57 inches.
- 30 grams for day--78 inches.
- 10 grams for night--74 inches.
- 30 grams for night--94 inches.

(3) At night, attach a small, liquid-activated light to the balloon to aid in observation. For PIBAL charts, see Table 6-6A, page 6-11 (10-gram helium balloon) and Table 6-6B, page 6-12 (30-gram helium balloon).

l. **Forward Throw**. This refers to the effect of inertia on a falling object. An object that leaves an aircraft moves at the same speed as the aircraft. The parachutist (or bundle) continues to move in the direction of flight until the dynamics of gravity and the parachute take effect. Forward throw for rotary-wing aircraft equals half the aircraft speed, expressed in meters. Table 6-7, page 6-12 shows the amount of forward throw from a fixed-wing aircraft, by distance.

6-8. APPROACH AND DEPARTURE ROUTES

Pathfinders must choose adequate routes for the aircraft to and from the DZs. To ensure this, they consider--

- Enemy situation and location.
- Obstacles to the aircraft (TV towers, high-tension lines).
- Terrain higher than the DZ.
- No-fly areas.

HEAVY EQUIPMENT			
ALTITUDE (AGL IN FEET)	**WIDTH**	**DROP ZONE LENGTH**	
		ONE PLATFORM	**ADDITIONAL PLATFORMS**
To 1,100	600 Yards	1,000 Yards	Add 400 yards (C-130) or 500 yards (C-141 or C-5) to trailing edge for each additional platform.
Above 1,100	Add 30 yards to DZ width and length for each 100 feet above 1,000 feet (Add 15 yards to each side of the DZ).		
PERSONNEL			
ALTITUDE (AGL IN FEET)	**WIDTH**	**DROP ZONE LENGTH**	
		ONE PLATFORM	**ADDITIONAL PLATFORMS**
To 1,000	600 Yards	600 Yards	Add 75 yards to trailing edge for each additional parachutist. When using CAPES, add 100 yards each, instead.
Above 1,000	Add 30 yards to DZ width and length for each 100 feet above 1,000 feet (Add 15 yards to each side of the DZ).		

NOTES:
1. For day visual formations, increase width by 100 yards (50 yards each side).
   For SKE formation, increase width by 400 yards (200 yards each side).
   Official sunset to sunrise, increase width by 100 yards for single ship visual drops (50 yards each side) or 200 yards for visual formations (100 yards each side).
2. Official sunset to sunrise, increase length by 100 yards for visual drops (50 yards each end).

Table 6-5. Size criteria for tactical airlift drop zones, personnel, and heavy equipment.

D = RT

Determine additional size requirements.

D = Length of DZ in meters.

R = Aircraft's rate of speed in meters per second (MPS). To convert knots to meters per second--

- Multiply the number of knots by 0.51.
- Do not round this number up or down.

T = Time required to exit each load:

- Parachutists (personnel) require 1 second each, after the first, which is free. The formula for computing the total seconds required to drop personnel is (N - 1) x 1, with N equal to the total number of personnel. Thus, ten personnel require--

  (10 – 1) X 1 = 9 X 1 = 9 seconds

- Door bundles require 3 seconds each, after the first bundle. The formula for computing the total seconds required to drop bundles is (N - 1) x 3, with N equal to the total number of bundles. Thus, three bundles require--

  (3 – 1) X 3 = 2 X 3 = 6 seconds

EXAMPLE PROBLEM

What is the minimum GMRS DZ length needed for a C-130 to drop ten parachutists?

D = Length of DZ in meters (unknown).

R = 66.30 meters per second (130 x 0.51).

T = 9 seconds (1 second per parachutist, not counting the first).

SOLUTION

D = R x T

D = 66.3 MPS X 9 seconds = 596.7 meters
(Round up to nearest whole number, which is 597.)

D = 597 meters of usable DZ required.
For personnel drop zones, add a 200-meter buffer--100 meters on the leading edge and 100 meters on the trailing edge--to total 797 meters for the drop zone. (The commander can waive this requirement.)

Figure 6-2. Example usage of D = RT formula.

T = D / R

Calculate number of parachutists or bundles that a GMRS DZ of given length can accept in one pass

T = Amount of time in seconds that the aircraft will be over the DZ.

D = Distance of DZ in meters (length).

R = Rate of aircraft's speed expressed in meters per second. To convert knots to meters per second, multiply the knots by .51. Round this number up to the nearest whole number.

EXAMPLE PROBLEM

How many parachutists from a C-130 can a 750-meter-long GMRS drop zone accept on each pass?

T = The number of parachutists that can drop on a 750-meter long GMRS DZ.

D = 550 meters (750-meter drop zone less 100-meter buffer at each end).

R = 130 x 0.51 = 66.3 rounded up to 67.

SOLUTION

T = **D/R**

D/R = (550/67) = 8.2

T = = 8 seconds (always round down).

DZ Can accept nine parachutists per pass: eight parachutists, at one each second, plus one free.

Figure 6-3. Example usage of T = D/R formula.

Section II. DROP ZONE SUPPORT TEAM

The drop zone support team plans, establishes, and operates day and night drop zones for personnel and resupply missions flown by fixed-wing and rotary-wing aircraft. The DZST is responsible for accomplishing the mission on the DZ. In operations without the USAF special tactics team, the DZST will shoulder the overall responsibility for the conduct of operations on the DZ. The DZST represents both the airborne and airlift commanders. The DZST leader assumes all the responsibilities normally associated with the USAF STT and the DZSO.

6-9. ORGANIZATION

The DZST must have at least two members. It might need more, depending on the complexity of the mission. However, additional team members do not need DZST qualification. The senior member of the DZST functions as the team leader. He must hold the rank of NCO (sergeant or above in the US Army, E-4 or above in the USAF or USMC), an officer, or the civilian equivalent. He must have completed the appropriate initial training as a DZST member and must satisfy current parent service requirements. To conduct personnel and heavy equipment drops, he must also hold current jumpmaster qualification.

D = KAV

Calculate drift

D = The amount of drift in meters.

K = Load drift constants:

- Personnel ..... 3.0 meters
- Bundle ..... 1.5 meters
- Equipment ..... 1.5 meters
- Containerized delivery system (CDS) ..... 1.5 meters
- Tactical training bundle ..... 2.4 meters

A = Express drop altitude in hundreds of feet: For 800 feet, say "8"; for 850, say "8.5."

V = Velocity of the wind (Use either surface wind speed or MEW).

EXAMPLE PROBLEM

For a drop altitude of 800 feet and a wind speed of 11 knots, calculate a jumper's drift:

K = Load drift constant for jumper (personnel) = 3 meters.

A = Drop altitude = 800 feet, so in this example, A = 800/100 = 8.

V = Wind speed = 11 knots.

SOLUTION

D = K x A x V

D = 3 x 8 x 11

D = 264, in the example conditions, a jumper drifts 264 meters.

Figure 6-4. Example usage of D = KAV formula.

6-10. MISSIONS

Primary missions of the DZST include wartime CDS drops to battalion or smaller units. They also make peacetime, visual, meteorological-condition drops, with one to three aircraft, for personnel, CDS, and heavy equipment. Secondary missions include wartime drops of brigade size or larger units, peacetime drops of C-130 all-weather aerial delivery system (AWADS) involving one to three aircraft, or VMC drops of four or more aircraft.

6-11. EQUIPMENT FAMILIARIZATION

The DZST leader must know how to use equipment to set up, mark, and operate the drop zone. This includes the following items, more or less, depending on the mission:

a. **Anemometer**. The handheld, calibrated AN/PMQ 3A (NSN: 6660-00-515-4339) measures surface wind. With the trigger pressed down, the correctly oriented anemometer gives wind direction in degrees. It can read the wind from 0 to 15 knots on the low scale, and from 0 to 60 knots on the high scale. The anemometer requires recalibration every six months. Regardless of the method or device used to measure the wind on the DZ, the airborne commander must prevent static line personnel airdrops when the surface wind on the DZ exceeds 13 knots. The following USAIS messages authorize several commercially available anemometers for use in drop zone operations:

(1) DTG 101000Z Mar 94, Subject: Use of Anemometers During Airdrop Operations.
(2) DTG 212000Z Oct 94, Subject: Use of Turbo Meters During Static Line Airdrop Operations.

10-GRAM HELIUM BALLOON

INFLATE BALLOON TO 57" CIRCUMFERENCE FOR DAY AND 74" CIRCUMFERENCE FOR NIGHT.

DROP ALTITUDE IN FEET

ELEVATION ANGLE	500	750	1000	1250	1500	1750	2000	2500	3000	3500	4000	4500
70	02	02	01	01	01	01	01	01	01	01	01	01
60	03	02	02	02	02	02	02	02	02	02	02	02
55	03	03	03	03	03	03	03	03	03	03	03	03
50	04	04	03	03	03	03	03	03	03	03	03	03
45	05	04	04	04	04	04	04	04	04	04	04	04
40	06	05	05	05	05	05	05	04	04	04	04	04
35	07	06	06	06	06	06	06	05	05	05	05	05
30	08	07	07	07	07	07	07	07	06	06	06	06
25	10	09	09	09	08	08	08	08	08	08	08	08
24	11	10	09	09	09	09	08	08	08	08	08	08
23	11	10	10	09	09	09	09	08	08	08	08	08
22	12	11	10	10	10	10	09	09	09	09	09	09
21	12	11	11	10	10	10	10	10	10	10	10	10
20	13	12	11	11	11	11	11	10	10	10	10	10
19	14	13	12	12	11	11	11	11	11	11	11	11
18	15	13	13	12	12	12	12	12	11	11	11	11
17	16	14	13	13	13	13	12	12	12	12	12	12
16	17	15	14	14	14	13	13	13	13	13	13	13
15	18	16	15	15	14	14	14	14	14	14	14	14
14	19	17	16	16	16	15	15	15	15	15	15	15
13	21	19	18	17	17	17	17	16	16	16	16	16
12	22	20	19	19	18	18	18	18	17	17	17	17
11	24	22	21	21	20	20	20	19	19	19	19	19
10	27	25	23	23	22	22	22	21	21	21	21	21
09	30	27	26	26	25	24	24	24	23	23	23	23

ASCENSION TABLE	
TIME	ALT (FT)
0:10	80
0:20	170
0:30	250
0:40	330
0:50	400
1:02	500
1:10	540
1:20	610
1:30	670
1:43	750
1:50	790
2:25	1000
2:44	1100
3:05	1250
3:49	1500
4:30	1750
5:11	2000
6:34	2500
7:58	3000
9:22	3500
10:44	4000
12:08	4500

Table 6-6A. Conversion chart for 10-gram helium (pilot) balloon.

30-GRAM HELIUM BALLOON

INFLATE BALLOON TO 78" CIRCUMFERENCE FOR DAY AND 94" CIRCUMFERENCE FOR NIGHT.

DROP ALTITUDE IN FEET

ELEVATION ANGLE	500	750	1000	1250	1500	1750	2000	2500	3000	3500	4000	4500
80	01	01	01	01	01	01	01	01	01	01	01	01
70	03	03	03	02	02	02	02	02	02	02	02	02
60	04	04	04	04	04	04	04	04	04	04	04	04
55	05	05	05	05	05	05	05	05	05	05	04	04
50	06	06	06	06	06	06	06	06	05	05	05	05
45	07	07	07	07	07	07	07	07	07	06	06	06
40	09	08	08	08	08	08	08	08	08	08	08	08
35	10	10	10	10	10	10	10	09	09	09	09	09
30	12	12	12	12	12	12	12	11	11	11	11	11
25	15	15	15	15	15	15	14	14	14	14	14	14
24	16	16	15	15	15	15	15	15	15	15	15	15
23	17	17	16	16	15	15	15	15	15	15	15	15
22	18	18	17	17	17	17	17	16	16	16	16	16
21	19	19	18	18	18	17	17	17	17	17	17	17
20	20	20	19	19	19	19	18	18	18	18	18	17
19	21	20	20	20	20	20	19	19	19	19	19	18
18	22	22	21	21	21	21	20	20	20	20	20	20
17	23	23	23	22	22	22	22	22	21	21	21	21
16	25	25	24	24	24	24	23	23	23	23	22	22
15	27	27	26	26	25	25	25	25	24	24	24	24
14	29	29	28	27	27	27	27	27	26	26	26	25
13	31	30	30	30	30	29	29	29	28	28	28	27

ASCENSION TABLE	
TIME	ALT (FT)
0:10	120
0:20	240
0:30	360
0:42	500
0:50	400
1:02	600
1:10	830
1:17	1000
1:46	1250
2:10	1500
2:34	1750
2:56	2000
3:43	2500
4:31	3000
5:21	3500
6:09	4000
7:00	4500

Table 6-6B. Conversion chart for 30-gram helium (pilot) balloon.

	FORWARD THROW DISTANCES FOR FIXED-WING AIRCRAFT		
LOAD	**C-5**	**C-130**	**C-17/C-141**
Personnel or Door Bundle	229 M (250 YD)	229 M (250 YD)	229 M (250 YD)
Heavy Equipment	668 M (730 YD)	458 M (500 YD)	668 M (730 YD)
CDS		503 M (550 YD)	686 M (750 YD)
TTB		147 M (160 YD)	147 M (160 YD)

NOTE: To convert yards to meters, multiply yards by 0.9144.
To convert meters to yards, divide meters by 0.9144.

Table 6-7. Forward throw distances for fixed-wing aircraft.

b. **VS-17 Marker Panel, Aerial**. The two-sided VS-17 marker panel (NSN 8345-00-174-6865) measures 2 feet wide by 6 feet long. One side is international orange. The other side of the panel is cerise (red). Six tie-down points permit attachment to stakes. The short ends in the stowage pocket have three snap fasteners. When folded, the panel's olive drab green should show. Pathfinders should display the panel side whose color contrasts best against the surrounding area.

c. **Light, Marker, Ground Obstruction**. One BA-200 battery powers this "beanbag light" (NSN: 6230-00-115-9996). Interchangeable colored plastic domes offer different colors of light. These markers work well in light holes or on the surface. The ground crew secures the markers with tent pegs or by filling the bottom with sand or rocks.

d. **Raised-Angle Marker**. This locally constructed RAM marks the PI on CARP DZs. It consists of five VS-17 panels (Figure 6-5, page 6-15).

e. **Whelen Light**. This light attaches to the top of one of two types of battery originally used with the AN/PRC-77. To place the light into operation, the user seats it on top of the battery. Different colored domes offer different colors of light. The unit buys this light locally. The batteries are as follows:

- Dry battery BA-4386/U.
- Lithium battery BA-5598/U.

f. **M-2 Light Baton**. Two BA-30s power this flashlight (NSN: 6230-00-926-4331). Different lenses (stored in the base compartment) change the color of the light. This light works best in a light hole or on top of the ground attached to a tent peg.

g. **Aerial, Marker, Distress**. This omnidirectional flashing (strobe) light (NSN 6230-00-67-5209) has a very long range. An optional directional cover snaps on top for tactical operations. Other snap-on caps change color and function such as the black cap, which makes the strobe light invisible except to devices that can "see" infrared.

h. **Mirror, Emergency Signaling, Type II**. Pathfinders can use the signal mirror (NSN 6350-00-105-1252) to signal aircraft by reflected sunlight. The back of the mirror has a set of instructions for proper use and aiming. The signal mirror works even on hazy days. It works in all directions--not just when the user faces the sun--and the intended viewer can see it from as far away as the horizon.

i. **Pilot Balloon**. Pathfinders use the PIBAL 10- or 30-gram rubber balloon to measure the mean effective wind. They fill the balloon with helium until the balloon inflates to the specified circumference. National stock numbers for PIBALs follow:

- NSN 6660-00-663-7933, balloon, meteorological, 10-gram.
- NSN 6660-00-663-8159, balloon, meteorological, 30-gram.

j. **Lighting Unit**. This light (NSN 6660-00-839-4927) attaches to the PIBAL for night operations. Overinflating the PIBAL compensates for the weight of the light so it can ascend at the same rate as it would without the light. Water or any other fluid will

activate the PIBAL's wet-cell battery. Below 50 degrees Fahrenheit, warm water activates the light faster.

k. **Drift Scale**. This slide-type scale uses a 90-degree angle to measure the ascent of the PIBAL. Pathfinders use the drift scale to compute the mean effective wind. TSC locally produces the drift scale. Pathfinders can also use the *pocket transit* (small enough to carry in a pocket) *theodolite* (NSN 6675-00-861-7939) with built-in *clinometer* (NSN 6675-00-641-5735); or they can use the separate *clinometer* (NSN 6675-01-313-9730).

l. **AN/PRC-119A (SINCGARS) Radio**. This man-portable radio NSN 5820-01-267-9482) allows FM radio contact with aircraft. It also permits NAVAID for aircraft with FM-homing capabilities. Without power-increasing accessories, it transmits between 4 and 16 kilometers.

m. **AN/PRC-113 (Have Quick) Radio**. This man-portable UHF/VHF AM radio (NSN 5820-01-136-1519) has a quick, jam-resistant, ECCM transceiver. Pathfinders use it for short ranges--5 to 16 miles--for tactical, ground-to-ground, or ground-to-air communication.

6-12. COORDINATION

The drop zone coordination checklist provides the DZST leader with a tool for coordinating before the mission without having to communicate with the aircraft (Figure 6-6, page 6-18).

6-13. SUPPORT REQUIREMENTS

The following support requirements apply to multiple aircraft formations (USAF aircraft), personnel, and equipment; or to single aircraft operations on DZs more than 2,100 meters in length:

a. **Control Group**. The DZST leader ensures the DZST sets up on the DZ and is operational at least one hour before the drop. A complete control group consists of the following:

(1) DZST leader.
(2) Assistant DZST leader (DZST qualified).
(3) Malfunction officer or NCO with camera.
(4) Parachute-recovery detail (with saw and tree-climbing equipment).
(5) Radios at least one each for the DZST leader and assistant leader.
(6) Anemometers, one each for the DZST leader and the assistant DZST leader (AN/PMQ-3A or other acceptable anemometer).
(7) Smoke grenades and flares, as needed.
(8) Vehicles, as needed.
(9) Road guards, as needed.
(10) Military police, if needed to control vehicles and spectators.
(11) Two medical personnel with front line ambulance (FLA), except on CDS drops.
(12) Boat detail, if needed.

b. **Rescue Boat**. For a DZ within 1,000 meters of water (from any edge), and for water more than 4 feet deep or 40 feet wide, pathfinders must arrange for at least one boat. Each boat must have a boat operator and an assistant boat operator. The boat's passenger rating must indicate that the boat can safely carry both operators, all parachutists exiting on the first pass, a working engine, plus a life vest for each operator

and potential passenger. Ten minutes before TOT, the operators must have the boat in the water and its engine running. They must have a life jacket on board the boat for the first pass. For deliberate water jumps, each parachutist wears a life vest.

NOTE: Jumpers wearing B5s or B7s need no life jackets.

c. **Other Support**. The units may supplement these requirements based on the type of drop, size of the airborne operations, number of aircraft involved, and number of parachutists.

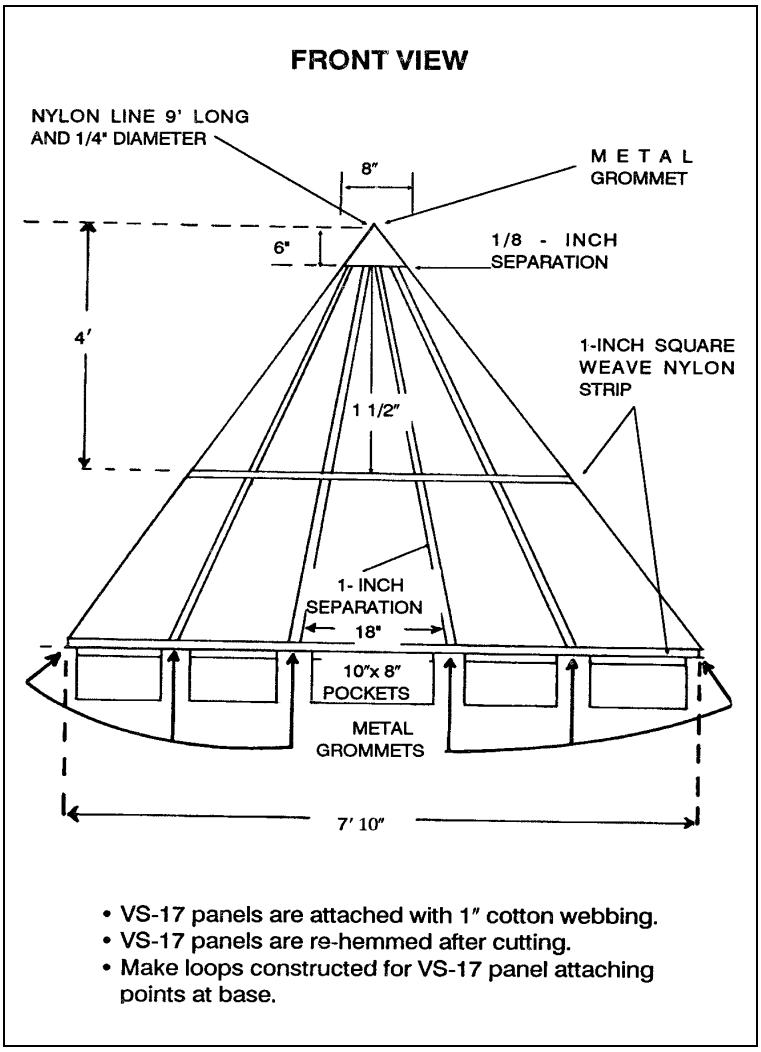


Figure 6-5. Raised-angle marker.

d. **Single Aircraft**. For a single aircraft with less than 20 seconds exit time and when the DZ measures less than 2,100 meters in length, a partial control group with at least the following personnel and equipment can handle the DZ:

(1) The DZST leader.

(2) The assistant DZST leader, who can support this type of DZ without having DZSTL qualification.

(3) Anemometers.

(4) One medic (with FLA). If he has received specialized training in these duties, as discussed in Chapter 20, FM 57-220, the DZST leader can perform this additional duty. CDS drops do not require the presence of a medic.

(5) Malfunction officer or NCO with camera.

(6) Parachute recovery detail.

(7) Radio.

(8) Compass.

(9) Smoke grenades or flares, as needed.

e. **Basic Equipment List**. The DZST leader should maintain an inventory of the following basic equipment to support the mission:

(1) VS-17 panels.

(2) Smoke grenades or flares.

(3) White lights such as an M-2 light baton.

(4) Air traffic control light (B-2).

(5) Signal mirror.

(6) Strobe light.

(7) Binoculars.

(8) Anemometer required for personnel and heavy equipment drops, recommended for measuring the wind before all types of drop.

(9) Compass.

(10) PIBAL kit with helium.

(11) Night vision goggles, for night drops.

(12) Other equipment as needed, based on premission coordination or unit SOP.

6-14. DROP ZONE SUPPORT TEAM LEADER'S DUTIES

The DZST leader establishes and operates the DZ. He selects the locations of the control center, point of impact (PI), and release point. He bears the ultimate responsibility for accomplishing the mission. Specifically, the leader--

a. Makes sure the DZ reaches full operational status one hour before drop time.

b. Conducts premission coordination.

c. Opens the DZ through range control. After the mission, accounts for all personnel, air items, and equipment, then closes the DZ.

d. At least one hour before the drop, reconnoiters the DZ on the ground or from the air for obstacles or safety hazards.

e. Establishes communication with departure airfield control officer NLT one hour before drop time.

f. Controls all ground and air MEDEVACs.

g. Submits postmission reports to the appropriate agencies.

h. Operates all visual acquisition aids.

i. Ensures someone relays no-drop signals to the drop aircraft.

j. Ensures all DZ markings display correctly.

k. Establishes a ten-minute window. Ensures pathfinders continuously monitor surface winds, starting NLT twelve minutes before TOT. This includes the ten-minute window plus two extra minutes to relay a *NO-DROP* signal, if needed. For example, if TOT is 0700 hours, then the ten-minute window (plus two minutes) begins at 0648 hours. If at any time during the ten-minute window the winds exceed allowable limits, the

DZST leader relays a *NO-DROP* to the aircraft. Once he calls a *NO-DROP*, he establishes a new ten-minute window (without an extra two minutes). For example, if the winds pick up at 0655 hours, the leader calls a *NO-DROP*. The new ten-minute window counts from the time of the *NO-DROP* and extends to the new TOT ten minutes after that, at 0705 hours.

l. When the DZ is 2,100 meters in length or longer, when exit time is 20 seconds or more, or for a multiple aircraft operation, takes surface wind readings from the control center location and from the highest point of elevation on the DZ.

m. Calls a no-drop when surface winds exceed the limits shown in Table 6-8, page 6-19.

6-15. CONTROL CENTER

The DZST leader controls and observes the airborne operation from the control center. Pathfinders also take wind readings here. The DZST leader should position all radios, signaling devices, and appropriate forms at the control center. The type of mission determines the location of the control center.

a. **Personnel Drops.** Locate the control center at the PI.

b. **CDS Drops.** Locate the control center 150 yards to the 6 o'clock of the PI.

c. **Free Drops, Heavy Equipment, and AWADS (Ceiling Less Than 600 Feet).** Locate the control center off the DZ where you can see both the approaching aircraft and the PI. For example, the wood line might obstruct the leading edge. If so, it would not make a good control center location for these types of drops.

d. **All GMRS and VIRS DZs.** Locate the control center at the RP.

6-16. SIGNALS

When voice control does not work, the ground support team uses visual signals to the aircraft. Two of the most important visual signals are NO-DROP and MISSION CANCELLATION.

a. To communicate a NO-DROP situation to the aircraft, scramble the shape designator and remove the markings or any other previously coordinated DZ signal.

(1) The drop aircraft pilot should continue to fly racetracks until you give the signal indicating clearance to drop. You can signal NO-DROP when--

- Winds exceed the maximum limitations for that type of drop.
- When you see vehicles moving on the DZ.
- When you see anything else unsafe on the DZ.

(2) Decide in mission coordination how many no-drop passes the pilot must fly before the mission is automatically cancelled and the pilot can begin his return to base.

b. Cover signals for CLEAR TO DROP also. You may decide to indicate clearance to drop by emplacing DZ markings. You can also use this means if you have no smoke. If you plan to use smoke, decide what each color of smoke will mean, but avoid using red to mean CLEAR TO DROP.

c. At night, your CLEAR-TO-DROP signals could include any means coordinated in advance such as shade-designator illumination, a flashing white light, a green light, and so on.

1. Confirm the following:
   - Mission.
   - DZ location.
   - DZ name.
   - Number of bundles and parachutists.
   - JAAT sequence number.
   - Time on target.
   - Weather decision time.
2. Verify the current DZ survey (AF Form 3823).
3. Verify the following information:
   - Type of drop (HE, CDS, or personnel).
   - Type and number of aircraft.
   - Time between flights and passes.
   - Number of racetracks.
   - Drop speed and heading.
   - Drop altitude: AGL IND.
   - Type of parachute.
   - Ground quick disconnects.
4. Confirm the following DZ information:
   - Type of markings (GMRS, CARP, VIRS).
   - Code letter.
   - Timing points.
   - Primary drop signal.
   - Alternate drop signal.
   - Primary no-drop signal.
   - Alternate no-drop signal.
   - Mission cancellation signal.
   - Obstacle markings.
5. Coordinate DZ support capabilities:
   - Communications available.
   - Frequencies and call signs.
   - Acquisition aids available.
   - NAVAIDs.
   - MEW equipment.
6. Coordinate airspace.
7. Confirm aircraft (mission) commander's name, unit, telephone number.
8. Enter DZST leader's name, rank, unit, telephone number:
9. Follow DZ reporting procedures for scoring, incidents, and accidents.

Figure 6-6. Drop zone coordination checklist.

TYPE OF LOAD	SURFACE WIND (IN KNOTS)
Personnel (land)	13
Personnel (water)	17
HALO or HAHO	18
Equipment without ground disconnects	13
Equipment with ground disconnects	17
CDS or door bundles using G-13 or G-14 parachutes	20
USAF tactical training bundles	25
High-velocity CDS	No Restrictions

NOTE: For USAF personnel and additional equipment, see Chapter 2, AFI 13-217.

Table 6-8. Surface wind limits for airdrops.

6-17. DETERMINATION OF RELEASE POINT LOCATION

To determine a release point on a GMRS drop zone, Air Force fixed wing VIRS drop zone, or Army rotary wing VIRS drop zone (Figure 6-7, page 6-20)--

a. **Step 1.** Determine the location of the point of impact, where the first parachutist or load will land. The following criteria should apply:

(1) ***Door Bundles.*** Locate the PI at the leading edge of the tree line, centerline.

(2) ***Personnel.*** Locate the PI on the leading edge of the 100-meter buffer zone, centerline.

(3) ***CDS and Heavy Equipment.*** See AF Form 3823 for the surveyed PI location.

(4) ***CDS and Heavy Equipment on Nonsurveyed DZs.*** See the standard PI locations for tactical assessments.

b. **Step 2**. Determine the drift direction and distance.

(1) Compute a D = KAV formula for your mission.

(2) Determine back azimuth of wind direction.

(3) From the PI location, pace off the distance computed from the D = KAV formula into the wind.

(4) If the wind blows to an azimuth of 250 degrees, then use 070 degrees for the pace-off azimuth.

c. **Step 3**.

(1) Determine the forward throw.

(2) Once you have paced off the drift, walk off the forward throw.

(3) To do this, shoot a back azimuth of the drop heading and walk the distance of the forward throw (for Air Force aircraft forward throw, refer to Table 6-7, page 6-12).

(4) For rotary wing aircraft, divide the drop airspeed in half, and express in meters. For example, the drop speed of 90 knots equals 45 meters of forward throw. The release point is at the end of the forward throw (Table 6-7, page 6-12).

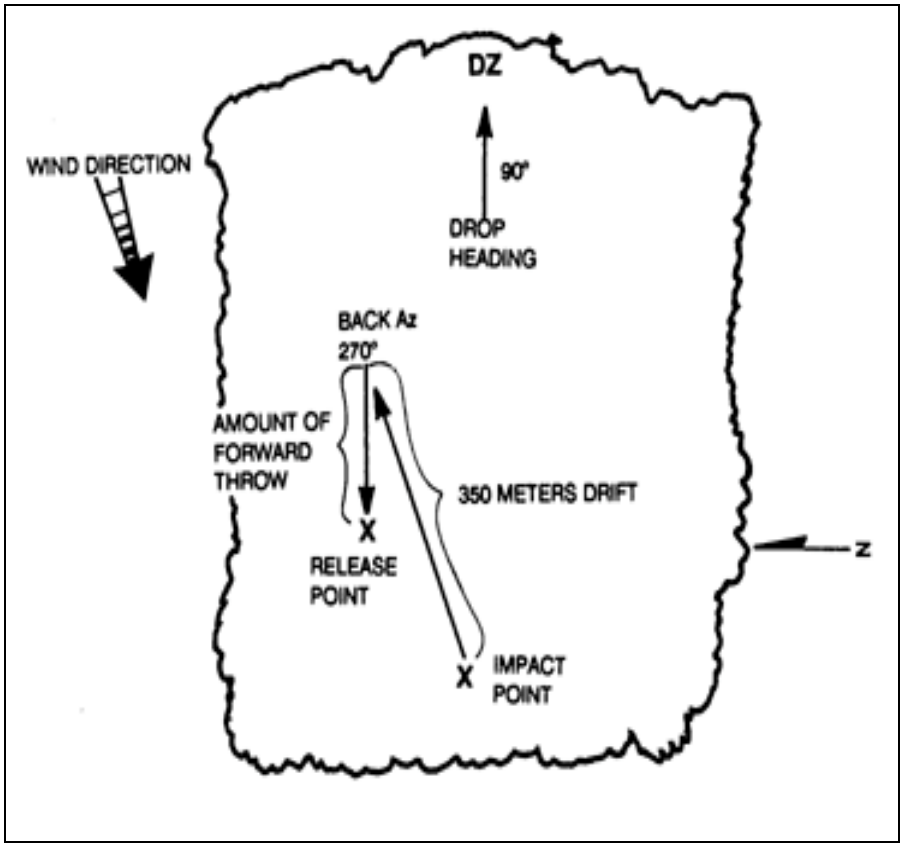


Figure 6-7. Release point location.

6-18. GROUND-MARKING RELEASE SYSTEM

The GMRS offers the DZST a way to identify the release point to the drop aircraft without using a radio. The pilot uses the ground markings to adjust his flight path 100 meters to the right of the corner panel or light, and parallel to the approach-corner panel or light axis. (This discussion uses the words "panel" and "light" interchangeably.)

a. **Patterns**. Use VS-17 panels to mark the DZ with an inverted "L," "H," or "T" pattern.

(1) ***Inverted "L" Pattern.*** The inverted "L" has four panels:

- The approach panel.
- The corner panel.
- The alignment panel.
- The flanker panel.

(2) ***"H" and "T" Patterns***. Align these other panels with and orient them on the corner panel. Due to side-angle-vision limitations in the C-5 and C-141, use the seven-panel "H" and six-panel "T" patterns for these aircraft.

b. **VS-17 Panels**. Figure 6-8, page 6-22, shows panel emplacement for "H" and "T" patterns.

(1) ***Corner Panel***. Set up the corner panel 100 meters to the left of the RP (as seen from drop heading).

(2) ***Alignment Panel***. Place the alignment panel 50 meters to the left of the corner panel.

(3) ***Approach Panel***. Place the approach panel 50 meters in front of the corner panel, as seen from the drop heading.

(4) ***Flanker Panel***. Place the flanker panel 150 meters to the left of the alignment panel, as seen from the drop heading.

c. **Drop Zone Support Team.** Place the markings where obstacles will not mask the pilot's line of sight. As a guide, use a mask-clearance ratio of 1 to 15 units of horizontal clearance (Figure 6-9, page 6-23).

(1) For example, suppose you must position a DZ marker near a terrain mask, such as the edge of a forest on the DZ approach. The trees measure 10 meters (33 feet) high. The markings would require 150 meters (492 feet) of horizontal clearance from the trees (Figure 6-10, page 6-24).

(2) If any of the GMRS markings fall within a 15-to-1 mask clearance ratio on the approach end of the drop zone, you can place an Army code letter (H, E, A, T) or a far (marker) panel on the trailing edge of a DZ. However, before doing so, you must have coordinated this during the DZST briefing or during an aircrew mission briefing. Using a code letter will distinguish this DZ from other DZs in the area. The code letter is located at the end of the DZ or where the pilot can see it best.

d. **Lights**. At night, replace panels with lights--use one light for each panel. Use directional lights for the approach, corner, alignment, and flanker. If necessary, you can use the directional light holes for the far code letter and line up the base light with the corner light. Figure 6-10 (page 6-24) provides construction requirements for Army code letters. Mark the release point with some type of identifiable light source to distinguish it from all other DZ markings.

6-19. ARMY VERBALLY INITIATED RELEASE SYSTEM

The Army VIRS method establishes the release point on the DZ via radio communications. If tactically feasible, a code letter can mark the RP. However, the aircraft initiates the drop on verbal command from the ground.

a. Emplace a standard Army code letter with VS-17 panels (for daytime operations) at the release point. Position the base panel of this code letter exactly on the RP. Use code letter H, E, A, or T. Make the letter at least two panels high by one panel wide (Figure 6-10, page 6-24).

b. Emplace a flank panel to the left of a code letter at a distance of 200 meters or on the edge of the DZ, whichever is closer. Emplace a far panel 500 meters from the code letter along the drop heading or at the end of the DZ, whichever is closer. Position each panel with its long axis parallel to the drop heading and raised 45 degrees back toward the code letter. The GTA radio operator positions himself at the release point.

c. At night, replace the panels with lights. Make the code letter at least four lights high by three lights wide, and leave 5 meters between each light. To limit ground observation, you may place the code letter, flank, and far light in holes.

- Place the code letter and far light in directional holes.
- Place the flank light in a bidirectional hole.

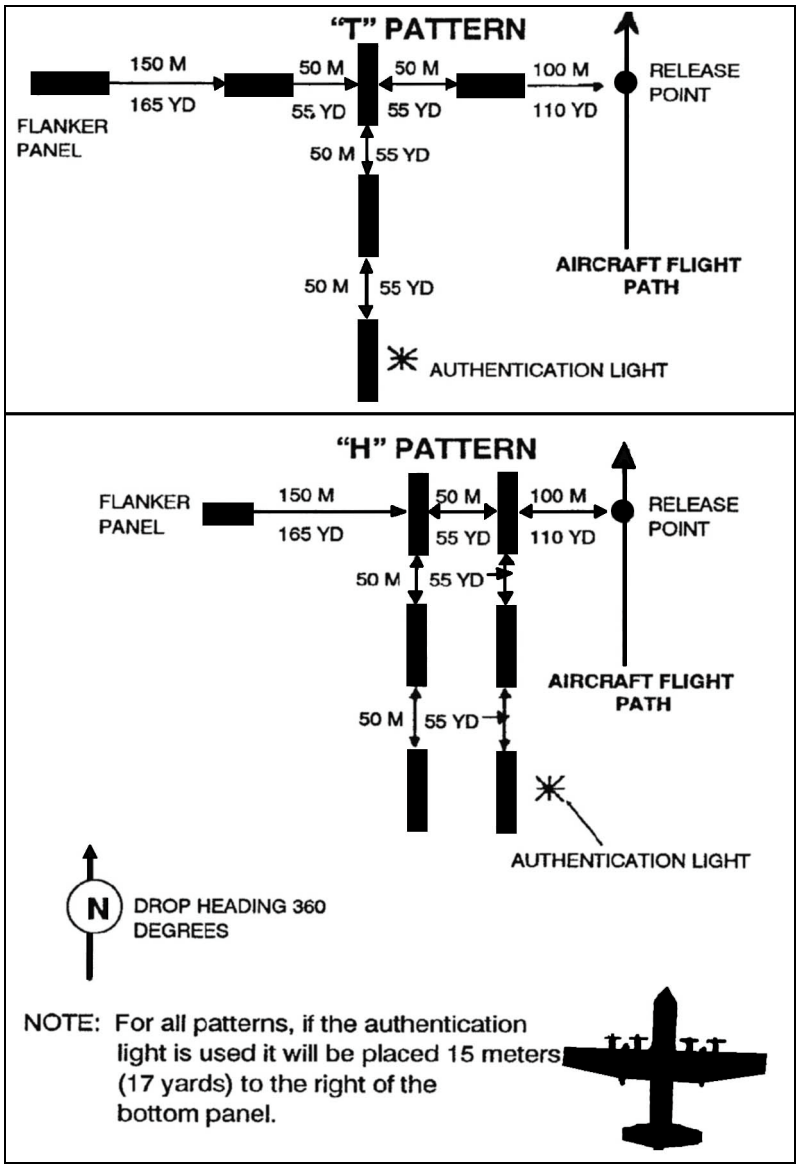


Figure 6-8. Panel emplacement.

d. If the RP falls off the DZ, hiding the markings, or if the GTA operator cannot see the aircraft, change the parachute drop to a jumpmaster-directed release operation using the wind streamer vector count (Figure 6-11, page 6-25).

e. If the RP falls off the DZ and the jumpmaster cannot count the wind streamer vectors, he may release early or late. To release late, he determines how many seconds the aircraft must fly past the GTA operator before he begins the release. For example, multiplying a drop speed of 70 knots by the conversion factor of 0.51 equals 36 meters per second of flight (knots x 0.51 = meters per second).

f. On an Army VIRS DZ, where trees obscure the RP, you may use an offset (Figure 6-12, page 6-26).

(1) An UH-60A is traveling at a speed of 70 knots (about 36 MPS).

(2) RP location is 108 meters into the wood line.

(3) As the aircraft passes over the code letter, the GTA operator begins counting, "ONE THOUSAND, TWO THOUSAND, THREE THOUSAND…"

(4) At the end of three seconds, the GTA operator transmits, "EXECUTE, EXECUTE, EXECUTE."

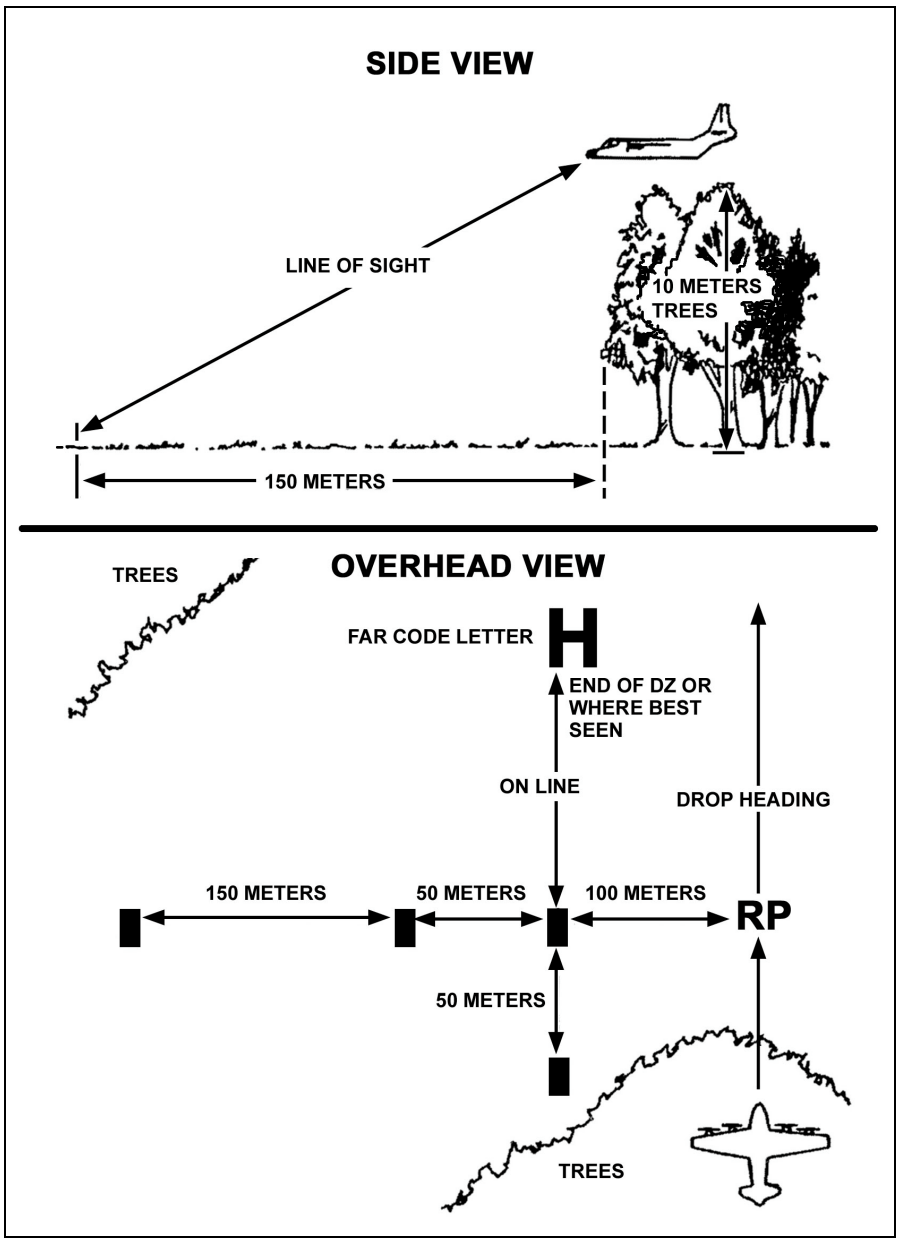


Figure 6-9. The 15-to-1 mask clearance ratio.

6-20. AIR FORCE VERBALLY INITIATED RELEASE SYSTEM

When using USAF VIRS, the DZST leader verbally guides the pilot over the RP to align the aircraft for the drop. Figure 6-13, page 6-27 shows an example USAF VIRS transmission. The leader-

a. Uses this method when the tactical situation prevents use of regular markings or when aircraft pilots could not see regular markings from the air.

b. Chooses the VIRS DZ just as he would choose a GMRS or rotary-wing VIRS release point. (Figure 6-7, page 6-20, shows how to determine the location of the release point.) Unlike those release points, however, the USAF VIRS DZ RP requires no markings.

c. Sets up communications with the drop aircraft and at least two FM, VHF, and UHF radios on the DZ.

d. Transmits concise instructions to the aircraft. To align the aircraft on the desired inbound heading, he gives left and right turns. When the aircraft lines up on course, the pathfinder signals STOP TURN. About five seconds before the release, or at some other moment (as briefed), he signals STANDBY.

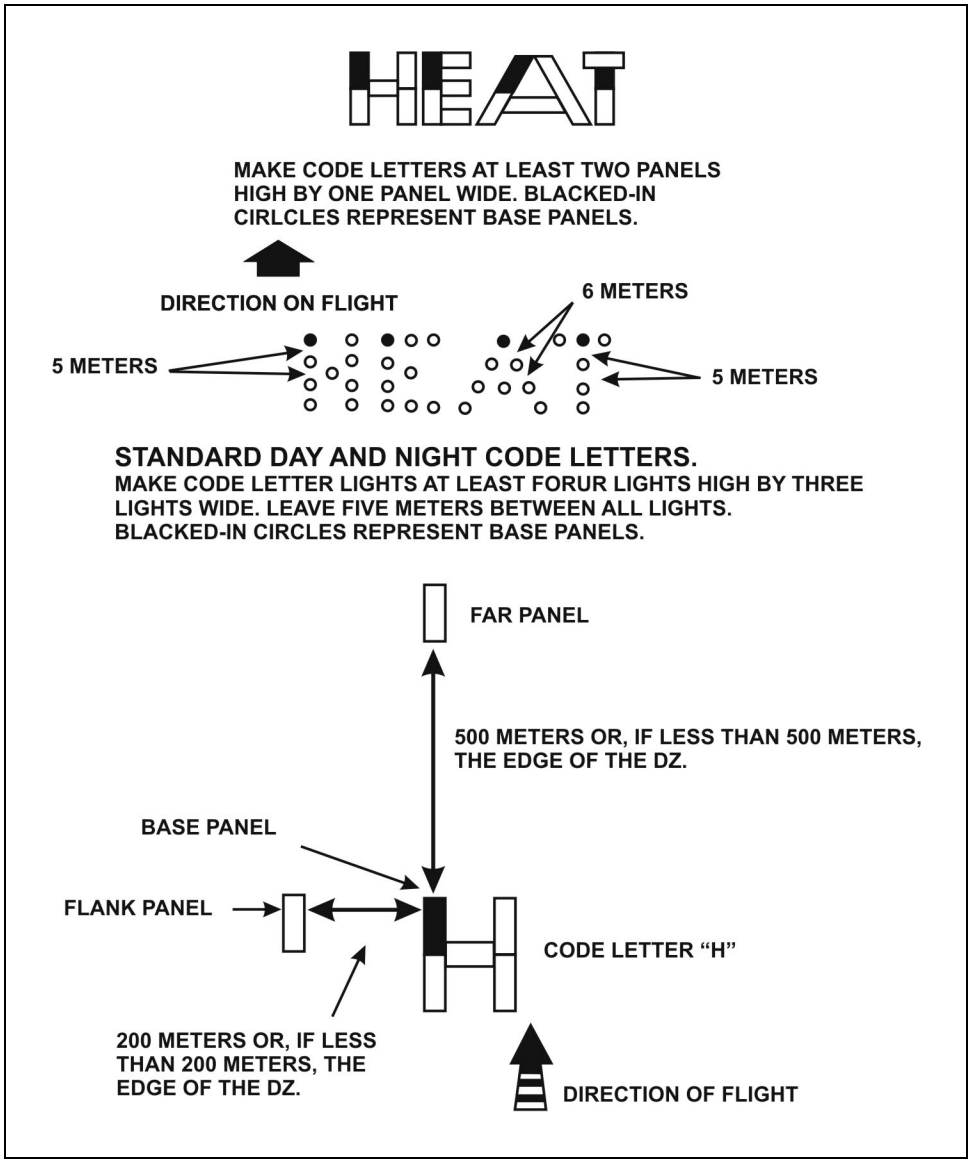


Figure 6-10. Horizontal clearance and marker construction.

e. When the aircraft reaches the predetermined release point, gives an EXECUTE three times.

f. When transmitting the MEW to the aircraft, make sure to identify it as such. State the altitude used to obtain it. Also provide pertinent details about any erratic winds or wind shears reported by other aircraft.

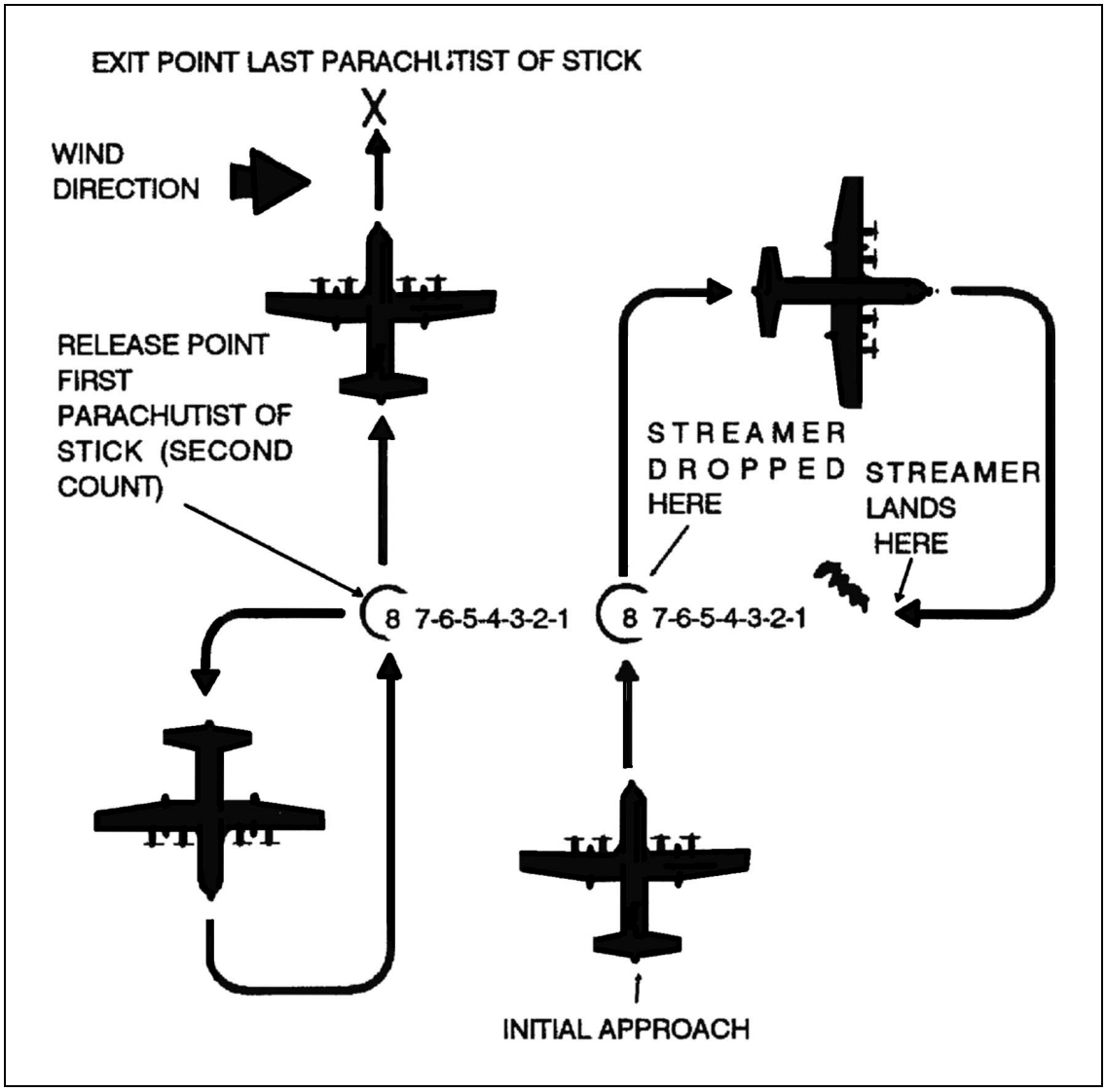


Figure 6-11. Wind streamer vector count.

6-21. AIR FORCE COMPUTED AIR RELEASE POINT

The DZST leader and DZ party mark the point of impact on a surveyed DZ. The aircraft navigator computes the release point from the air.

a. **Coordination**. Coordinate authentication markings with the aircrew.

b. **Code Letter Elevation**. Never elevate the panels in the code letter.

c. **Personnel Buffer Zone**. If the PI is located closer than 300 yards (274 meters) from any edge of the drop zone, allow a 200-yard (183-meter) buffer zone for personnel on the trail edge of the DZ.

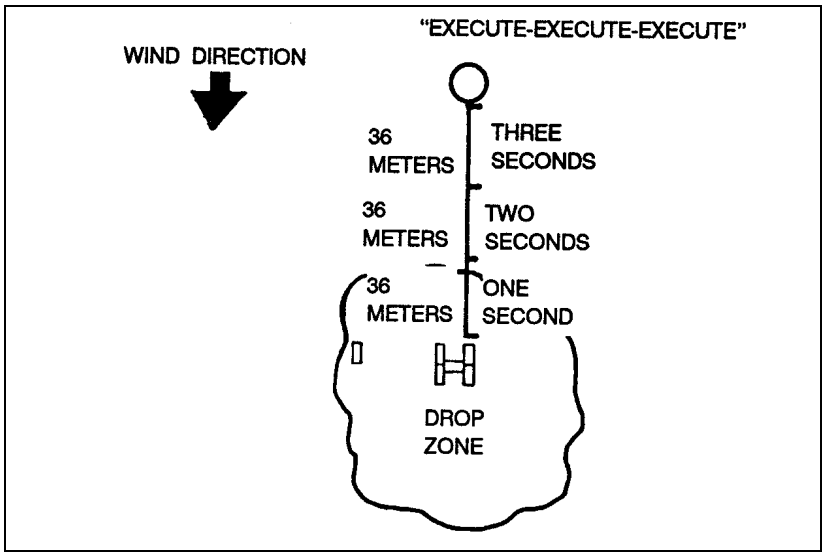


Figure 6-12. Example Army VIRS offset.

d. **Markers**.

(1) ***Day Operations***. For day operations (Figure 6-14, page 6-28), pathfinders mark the point of impact with a RAM (raised-angle marker, Figure 6-5, page 6-15) and an Air Force code letter, which could be a "J," "C," "A," "R," or "S" (Figure 6-15, page 6-29). This applies to rectangular drop zones. They use "H" or "O" for circular drop zones. Each letter must measure at least 35-feet square, and requires at least nine panels flat on the ground.

(2) ***Night Operations***. For night operations (Figure 6-16, page 6-30), mark the point of impact with--

(a) A code letter (made of lights) placed at the point of impact.

(b) One flanker light placed 250 meters to the left and right of the shape designator.

(c) A trailing edge light placed 1,000 meters from the shape designator or at the trailing edge of the surveyed DZ, whichever is closer to the PI.

e. **Authentication**.

(1) ***Day Operations.*** During day operations, authenticate or identify different sites by specifying drop times, drop headings, or alternating panel colors.

(2) ***Night Operations.*** During night operations, authenticate or identify different sites by replacing one light in the code letter with any color light except white.

f. **Circular Markings.** To determine the desired drop heading, coordinate circular DZ markings 24 hours in advance.

g. **Smoke.** You may display smoke, in any color besides red, next to and downwind of the RAM or code letter. This helps show the wind direction, so it also helps the pilot visually acquire the DZ.

h. **Point of Impact.** The Army ground unit commander may position the PI anywhere on the "surveyed DZ" and, as needed, insert his forces to accomplish the mission. He must inform the supporting airlift and the DZST leader of the PI location early enough for them to plan the mission. If the GUC chooses a PI closer than 300 yards (274 meters) from any edge of the surveyed DZ, then he accepts the responsibility for an off-the-DZ impact.

INITIAL RADIO COMMUNICATION

AIRCRAFT: T2S26, THIS IS HERC 30, OVER.

DZST: HERC 30, THIS IS T2S26, AUTHENTICATE DELTA FOXTROT, OVER.

AIRCRAFT: T2S26, THIS IS HERC 30, GOLF, OVER.

DZST: HERC 30, T2S26--NOT IN SIGHT. CONTINUE, OVER.

ONCE THE AIRCRAFT IS ABOUT ONE MINUTE OUT

DZST: HERC 30, THIS IS T2S26, HAVE YOU IN SIGHT, TURN LEFT.

DZST: (ELIMINATE CALL SIGNS) TURN LEFT. . . STOP TURN.

DZST: ON COURSE, STAND BY. (5 SECONDS FROM DROP).

DZST: EXECUTE, EXECUTE, EXECUTE, T2S26 OUT.

Figure 6-13. Example USAF VIRS transmission.

6-22. ASSAULT ZONE AVAILABILITY REPORT

The Air Force lists all available approved drop zones in its AZAR. This list stems from input provided by 21 AF, McGuire AFB, New Jersey, and from 22 AF, Travis AFB, California. The AZAR identifies CONUS drop zones, landing zones, and extraction zones available for use by the Air Mobility Command.

6-23. DROP ZONE SURVEY

Air Force Form 3823 (front and back, Figure 6-17A and Figure 6-17B, pages 6-32 and 6-33) includes all needed information about the drop zone. The boxes on the form are self-explanatory. If needed, Air Force Instruction (AFI) 13-217 provides additional detailed instructions. Though AF Form 3823 replaces MAC Form 339 (Figures 6-18A and 18B, pages 6-34 and 6-35), pathfinders who have already documented a DZ on the old form can keep using that one until the DZ changes or until no one uses that DZ anymore.

6-24. TACTICAL ASSESSMENT

During contingency, wartime, and major training exercise participation, DZST leaders may have to tactically locate and assess a potential drop zone for follow-on airdrop resupply or reinforcement missions.

a. Normally, the Air Force special tactics teams (STTs) use the AF Form 3823 for this reconnaissance type mission. However, in the absence of a special tactics team (STT), the DZST leader can use the checklist shown in Figure 6-19, page 6-36 to tactically assess the DZ.

b. Tactically assessed DZs may *only* receive airdrops if--

(1) During training events, the airdrop is located within a military reservation or on property the US government has leased.

(2) The supported service accepts responsibility for any damage that occurs as a result of the airdrop activity.

(3) All parties allow adequate time for safe and effective planning.

c. After completing the tactical assessment and receiving approval from the Air Force, those conducting the airdrop follow guidelines for CARP markings (Table 6-9, page 6-36).

(1) ***CDS Drops***.

(a) *C-130*. For C-130 CDS drops during the day, choose a PI at least the following distance from the leading edge of the DZ and centerline:

- Daytime--200 yards (183 meters).
- Nighttime--250 yards (229 meters).

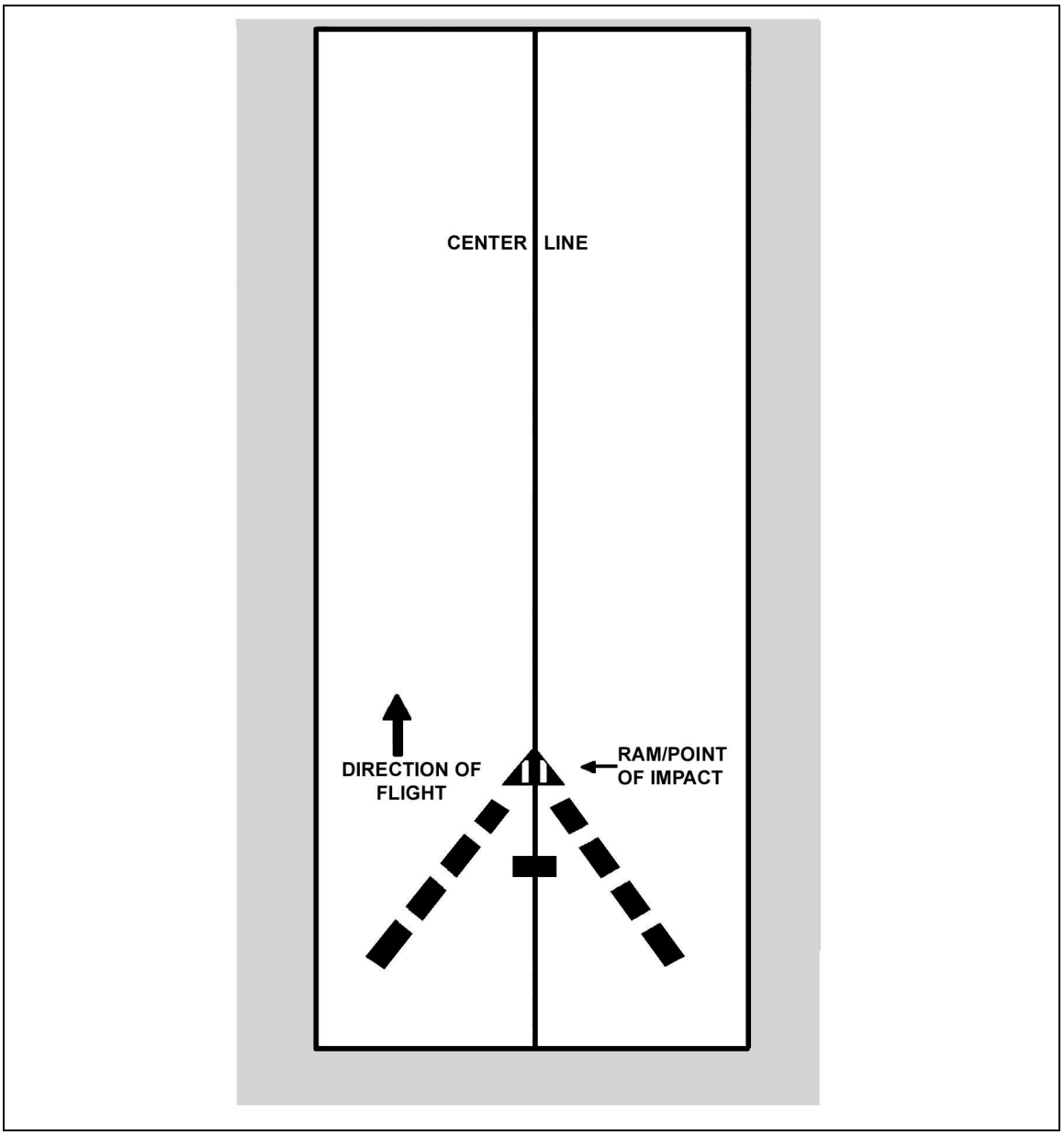


Figure 6-14. Drop zone placement (day).

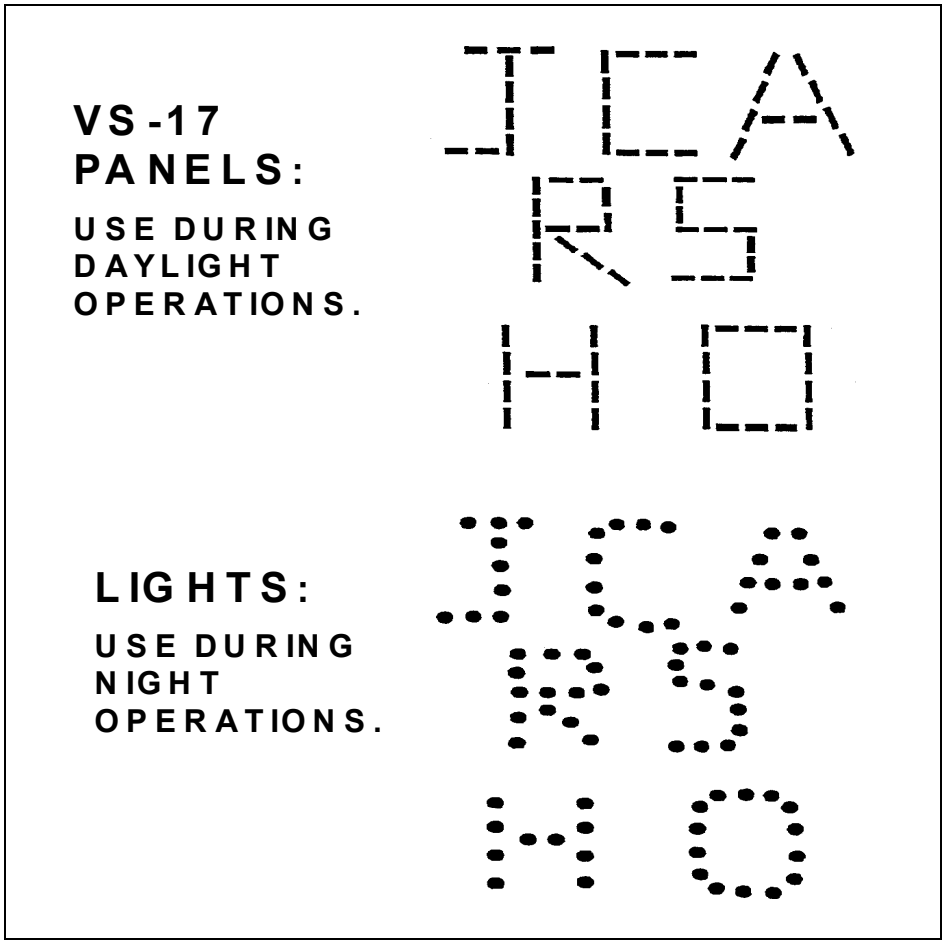


Figure 6-15. Code letters.

(b) *C-141/C-17*. For C-141 or C-17 CDS drops, choose a PI at least the following distances from the leading edge of the DZ:

- Daytime--225 yards (206 meters).
- Nighttime--275 yards (251 meters).

(2) ***Personnel Drops***. For all personnel drops by USAF fixed-wing aircraft, choose a PI at least the following distances from the leading edge of the DZ:

- Daytime--at least 300 yards (274 meters).
- Nighttime--at least 350 yards (320 meters).

(3) ***Heavy Equipment Drops***. For all heavy equipment drops by USAF fixed-wing aircraft, choose a PI at least the following distances from the leading edge of the DZ:

- Daytime--at least 500 yards (457 meters).
- Nighttime--at least 550 yards (503 meters).

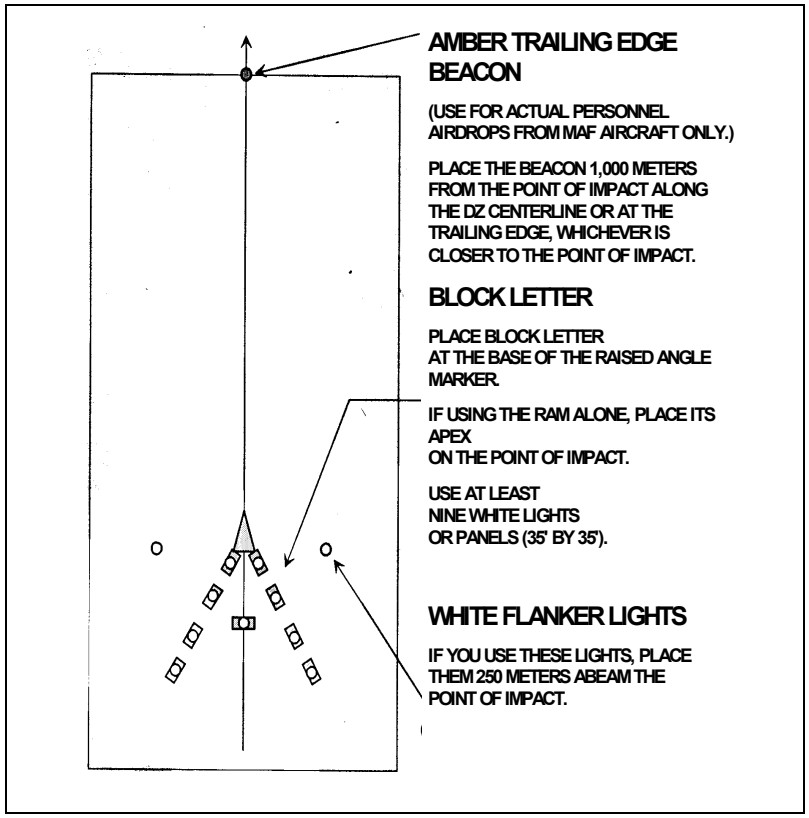


Figure 6-16. Drop zone placement (night).

6-25. CONTROL LOG FOR AIRDROP, AIRLAND, OR EXTRACTION ZONE

The AMC Form 168 serves as a scorecard for the Air Force. Since the aircrew on the CARP drop zone computes the release point, the Air Force must document the crew's performance. The DZST leader completes the blocks on AMC Form 168 (Figure 6-20, page 6-37). In Blocks 2, 3, and 4, he can name the same or different people. After completing the form, he forwards it to his air operations officer, who submits it through the chain of command to the Air Force representative.

a. ***LOCATION***. Write the name and grid coordinates for the DZ, LZ, and EZ.

b. ***SST AND UNIT***. Write the names of the members of the special tactics team and of the unit controlling the DZ.

c. ***DZ–LZ–EZ CONTROL OFFICER(S) AND UNIT(S)***. Write the name of the controlling individual(s) and unit(s).

d. ***DROP ZONE SAFETY OFFICER AND UNIT***. Write the name of DZ safety officer and unit.

e. ***LEGEND***. This section of the form explains both the abbreviations printed on this form and the abbreviations you can use when completing it.

f. ***LINE NO***. On any given DZ mission, each line number represents an individual pass over the DZ, even on a multiple-aircraft DZ. For example, use three lines for a three-ship operation. Use a line and line number for each no-drop pass, too. Document the reason for each no-drop pass in the REMARKS block.

g. ***TYPE ACFT***. Write the type aircraft, for example, "C-130."

h. ***UNIT***. Write the name of the flight crew's unit. (This is usually numeric.)

i. ***CALL SIGN***. If you have radio communications with the pilot, write the correct call sign.

j. ***PILOT – NAVIGATOR***. Write the last name and rank of both the pilot and the navigator.

k. ***TYPE MSN***. Based on your legend, write the letter that you are using to designate the mission type.

l. ***ETA***. Write what time you estimate the aircraft will arrive over the target. You can use a hard time or a block time.

m. ***ATA.*** Write the actual time of arrival.

n. ***ATD***. Write the actual time of departure.

o. ***STRIKE RPRT***. The information in these boxes (yards and clock direction) is the actual purpose of the AMC Form 168. Observe the first parachutist, bundle, or heavy equipment platform from the control center. At night, use NVG. If you maintain radio communication with the drop aircraft, relay the strike reports to it so the aircrew can adjust on following passes over the DZ.

(1) ***YDS***. Determine the distance to the first parachute in yards. If the first parachute lands within 25 yards of the point of impact, write the letters "PI" in this block to show that the parachute made a direct hit.

(2) ***CLOCK***. Determine the clock direction relative to the point of impact (12 o'clock is the magnetic drop heading).

p. ***AL EX***. For an airland or extraction. If you could not maintain visual contact with the first parachute, especially during multiple aircraft operations, then use the following method to determine whether to score parachutists satisfactory or unsatisfactory ("S" or "U"):

(1) ***S***. If 90 percent of the parachutes land on the DZ, write an "S" in this column.

(2) ***U***. If less than 90 percent land on the DZ, write a "U" in this column.

q. ***SURF WIND***. Write down the highest wind reading taken during the 10-minute window for that pass.

r. ***SCORE METHOD***. Write the first letter of the method you used to determine the distance from the PI to the first parachute:

- Write an "E" if you estimated the distance.
- Write a "P" if you paced off the distance.
- Write an "M" if you measured the distance.

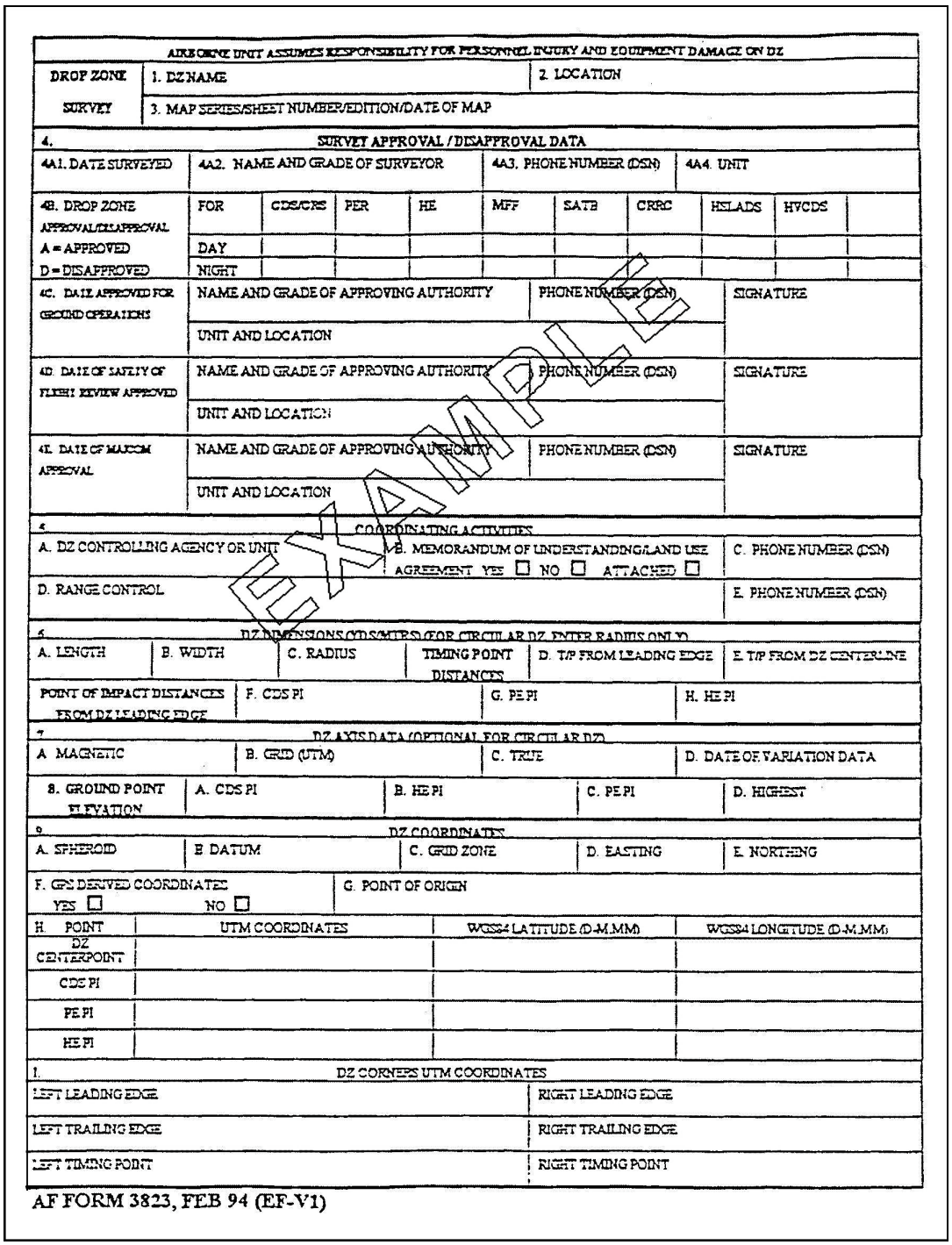
s. ***MEAN EFFECTIVE WIND***. If you use a pilot balloon on the DZ, determine a MEW and note it in this block. (MEW is the average wind speed between the ground and the drop altitude.) If you have established radio communications with the aircraft, give the aircrew the MEW before they make their first pass. This will help them calculate their release point.

(1) ***TIME***. Note the time that you determined the MEW.

(2) ***ALT***. Note the altitude you used to determine the MEW.

(3) ***DIRECTION and VELOCITY***. Measure the magnetic azimuth to the pilot balloon, and write down the reciprocal heading (MEW direction). When you report the MEW, give the altitude that you used to compute it. If you noted any erratic winds or wind shears, note that here also.

t. ***REMARKS (Continue on Reverse)***. Write down anything about the DZ operation that you think the Air Force might like to know before debriefing the pilot.



AIRBORNE UNIT ASSUMES RESPONSIBILITY FOR PERSONNEL INJURY AND EQUIPMENT DAMAGE ON DZ

DROP ZONE SURVEY	1. DZ NAME						2. LOCATION		
	3. MAP SERIES/SHEET NUMBER/EDITION/DATE OF MAP								
4. SURVEY APPROVAL / DISAPPROVAL DATA									
4A1. DATE SURVEYED	4A2. NAME AND GRADE OF SURVEYOR			4A3. PHONE NUMBER (DSN)			4A4. UNIT		
4B. DROP ZONE APPROVAL/DISAPPROVAL A = APPROVED D = DISAPPROVED	FOR	CDS/CRS	PER	HE	MFF	SATB	CRRC	HSLADS	HVCDS
	DAY								
	NIGHT								
4C. DATE APPROVED FOR GROUND OPERATIONS	NAME AND GRADE OF APPROVING AUTHORITY				PHONE NUMBER (DSN)		SIGNATURE		
	UNIT AND LOCATION								
4D. DATE OF SAFETY OF FLIGHT REVIEW APPROVED	NAME AND GRADE OF APPROVING AUTHORITY				PHONE NUMBER (DSN)		SIGNATURE		
	UNIT AND LOCATION								
4E. DATE OF MAJCOM APPROVAL	NAME AND GRADE OF APPROVING AUTHORITY				PHONE NUMBER (DSN)		SIGNATURE		
	UNIT AND LOCATION								
5. COORDINATING ACTIVITIES									
A. DZ CONTROLLING AGENCY OR UNIT				B. MEMORANDUM OF UNDERSTANDING/LAND USE AGREEMENT YES ☐ NO ☐ ATTACHED ☐			C. PHONE NUMBER (DSN)		
D. RANGE CONTROL							E. PHONE NUMBER (DSN)		
6. DZ DIMENSIONS (YDS/MTRS) (FOR CIRCULAR DZ, ENTER RADIUS ONLY)									
A. LENGTH	B. WIDTH	C. RADIUS	TIMING POINT DISTANCES	D. T/P FROM LEADING EDGE	E. T/P FROM DZ CENTERLINE				
POINT OF IMPACT DISTANCES FROM DZ LEADING EDGE	F. CDS PI	G. PE PI	H. HE PI						
7. DZ AXIS DATA (OPTIONAL FOR CIRCULAR DZ)									
A. MAGNETIC	B. GRID (UTM)	C. TRUE	D. DATE OF VARIATION DATA						
8. GROUND POINT ELEVATION	A. CDS PI	B. HE PI	C. PE PI	D. HIGHEST					
9. DZ COORDINATES									
A. SPHEROID	B. DATUM	C. GRID ZONE	D. EASTING	E. NORTHING					
F. GPS DERIVED COORDINATES YES ☐ NO ☐	G. POINT OF ORIGIN								
H. POINT	UTM COORDINATES			WGS84 LATITUDE (D-M.MM)			WGS84 LONGITUDE (D-M.MM)		
DZ CENTERPOINT									
CDS PI									
PE PI									
HE PI									
10. DZ CORNERS UTM COORDINATES									
LEFT LEADING EDGE				RIGHT LEADING EDGE					
LEFT TRAILING EDGE				RIGHT TRAILING EDGE					
LEFT TIMING POINT				RIGHT TIMING POINT					

EXAMPLE

AF FORM 3823, FEB 94 (EF-V1)

Figure 6-17A. Example completed AF Form 3823 (new form, front).

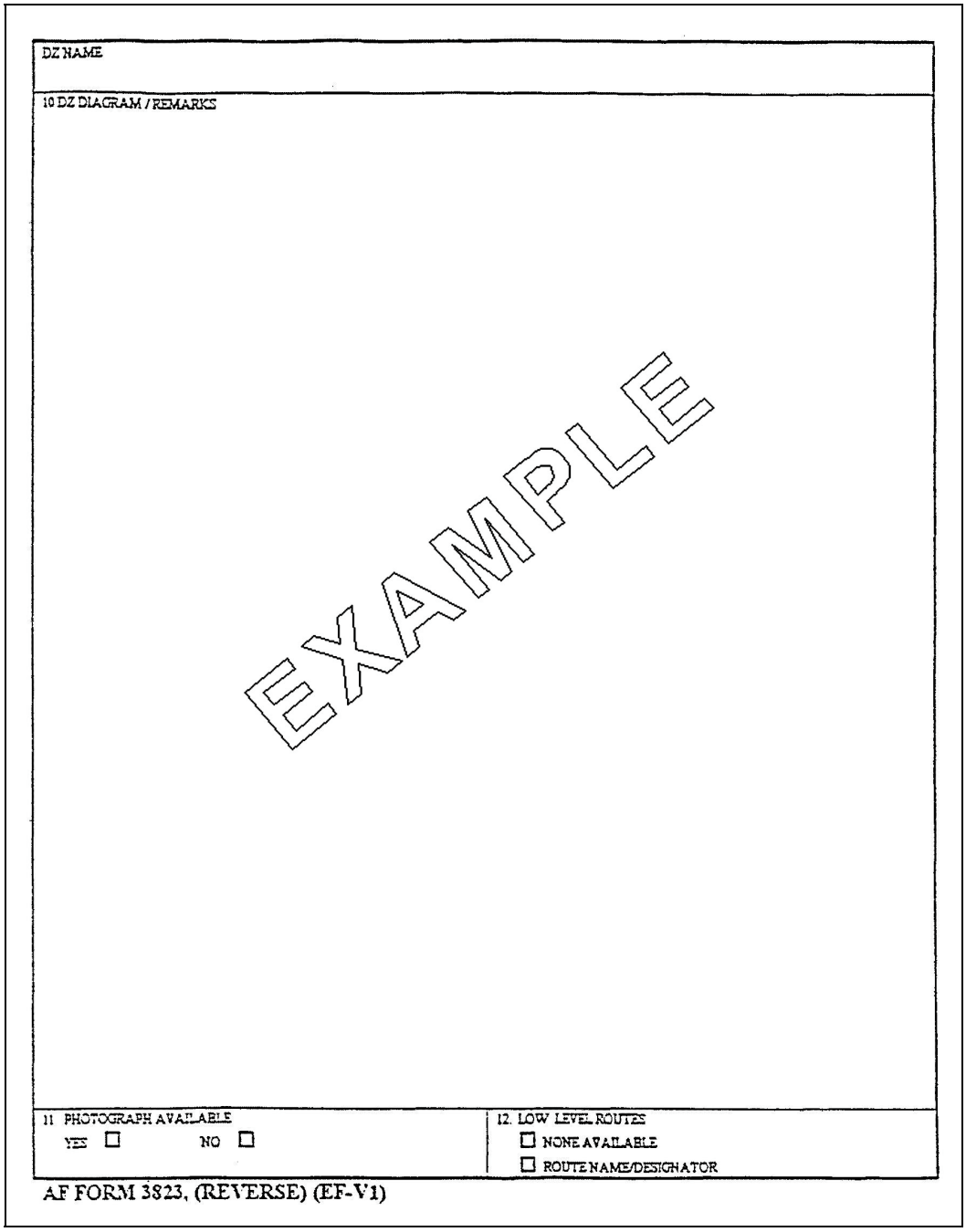


Figure 6-17B. Example completed AF Form 3823 (new form, back).

DROP ZONE SURVEY

1. Example DZ
2. Ft. Hunter-Liggett, CA
3. V 7955/Hunter-Liggett Special/1-DMATC/1971

4. SURVEY APPROVAL/DISAPPROVAL DATA

A. DATE SURVEYED: 23 Dec 88	TYPED NAME AND GRADE OF SURVEYOR: Mark a. Goodjob, Capt	PHONE NUMBER (AUTOVON): 544-1212	UNIT: OL-N 1702 MOBSS
B. DATE REVIEWED: 15 Jan 89	TYPED NAME AND GRADE OF REVIEWER: John B. Closelook, Capt	PHONE NUMBER (AUTOVON): 511-1313	SIGNATURE: John B. Closelook
	UNIT AND LOCATION: 63 MAW/DOXT Norton AFB, CA 92409-5000		
C. DATE APPROVED: 22 Feb 89	TYPED NAME AND GRADE OF APPROVING AUTHORITY: Steve E. Okaysum, Maj	PHONE NUMBER (AUTOVON): 555-1414	SIGNATURE: Steve E. Okaysum
	UNIT AND LOCATION: 22 AF/DOXT Travis AFB, CA 94535-5002		

D. DROP ZONE APPROVAL/DISAPPROVAL	FOR	CENTER	N	W	HAZARDS	DATA	COMM	VILLAGE		
A. APPROVED	DAY	A	A	A	A	A	B	A		
B. DISAPPROVED	NIGHT	A	A	A	A	A	B	A		

5. COORDINATING ACTIVITIES

A. CONTROLLING AGENCY OR UNIT: Ft. Hunter-Liggett Range Coordinator	PHONE NUMBER (AUTOVON): 533-1515
B. DROP CONTROL: Ft. Hunter-Liggett Range Control, Call Sign "Hunter 33", 41.05 FM, 229.5/126.2 AM	PHONE NUMBER (AUTOVON): 533-1616

6. DZ DIMENSIONS (Yds/Mtrs) (For Circular DZ, Enter Radius Only)

A. LENGTH	B. WIDTH	C. RADIUS	TURNING POINT ORIENTATION	D. FT FROM DZ LEADING EDGE	E. FT FROM DZ CENTERLINE
3230 yds	800 yds	n/a		700 yds	350 yds (each)
POINT OF IMPACT (PI) DISTANCES FROM DZ LEADING EDGE	F. CDS PI: 550 yds	G. NE PI: 350 yds			H. NW PI: 550 yds

7. DZ AXIS DATA

A. MAGNETIC: 274	B. GRID AZIMUTH: 288	C. TRUE: 289	D. DATE OF VARIATION DATA: 1988

8. GROUND POINT ELEVATION	A. CDS PI: 1220	B. NE PI: 1220	C. NW PI: 1225	D. HIGHEST: 1378

9. DZ COORDINATES

A. SPHEROID: Clarke 1866	B. GRID ZONE: 10	C. EASTING: 6	D. NORTHING: 39

E. POINT OF ORIGIN: 10S FQ 5540 7860, San Miguelito Ranch House Ruins, 1350 mtrs at 075 degrees Mag to Hvy/CDS PI

F. POINT	UTM COORDINATES	LATITUDE (DMS/H)	LONGITUDE (DMS/H)
DZ CENTERPOINT	5582 7892	N 35/56/38.6	W 121/16/20.7
CDS PI	5675 7862	N 35/56/28.3	W 121/15/44.0
NE PI	5692 7856	N 35/56/26.3	W 121/15/37.1
NW PI	5675 7862	N 35/56/28.3	W 121/15/44.0

G. DZ CORNER UTM COORDINATES

DZ LEADING EDGE	RIGHT LEADING EDGE
5712 7812	5734 7881
LEFT TRAILING EDGE: 5431 7903	RIGHT TRAILING EDGE: 5453 7973
LEFT TURNING PT: 5774 7796	RIGHT TURNING PT: 5794 7857

10. ZONE MARKER (ZM) POSITION DATA (Enter Additional ZM Points in Remarks)

A. PRIMARY POINT OF IMPACT	B. DISTANCE PRIOR/AFTER PI (Yards)	C. DISTANCE LEFT/RIGHT OF PI (Yards)
HVY PI	200 yds Prior	100 yds Left

MAC Form 339, FEB 89 PREVIOUS EDITION IS OBSOLETE

Figure 6-18A. Example completed MAC Form 339 (old form, front).

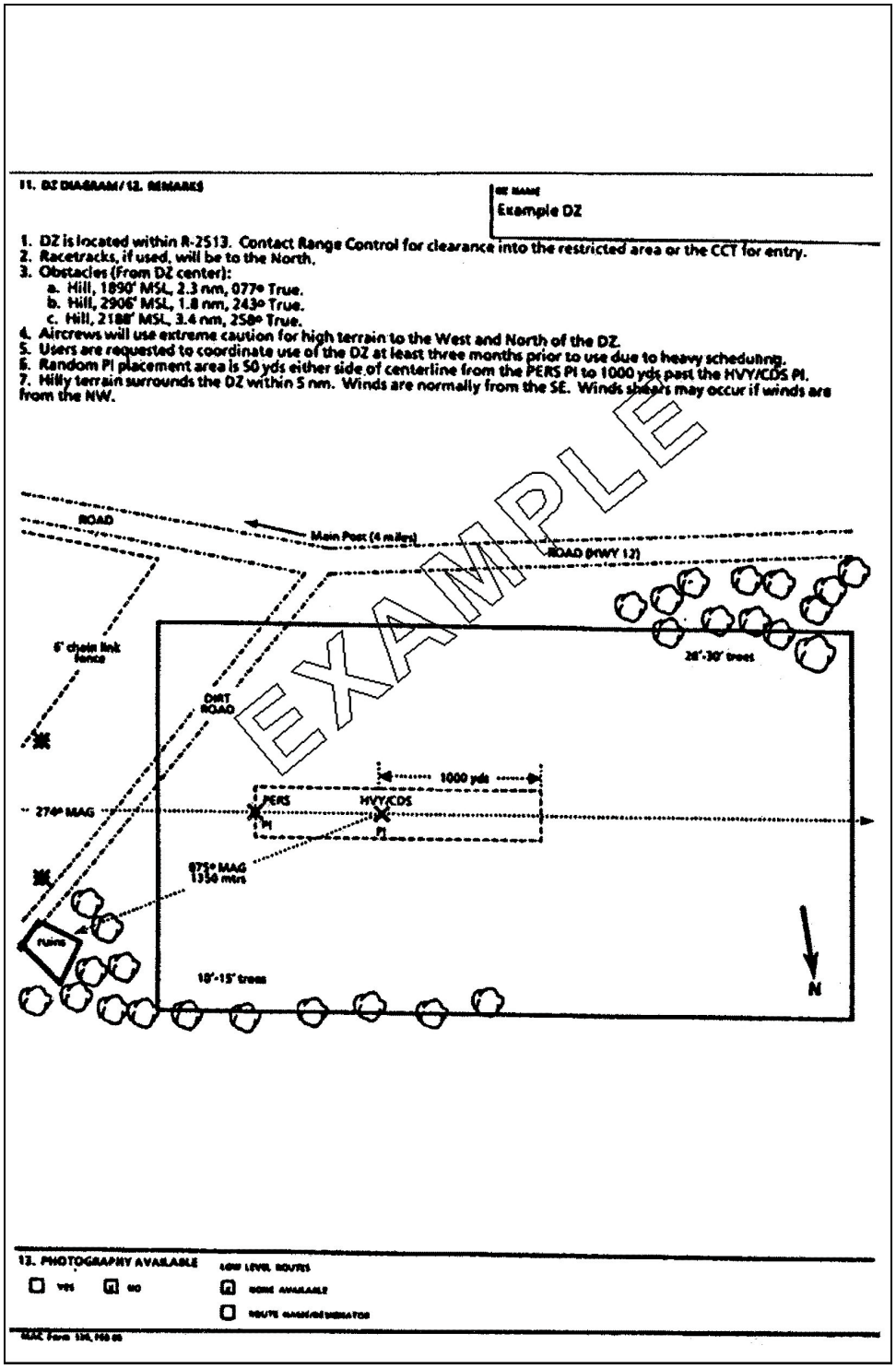


Figure 6-18B. Example completed MAC Form 339 (old form, back).

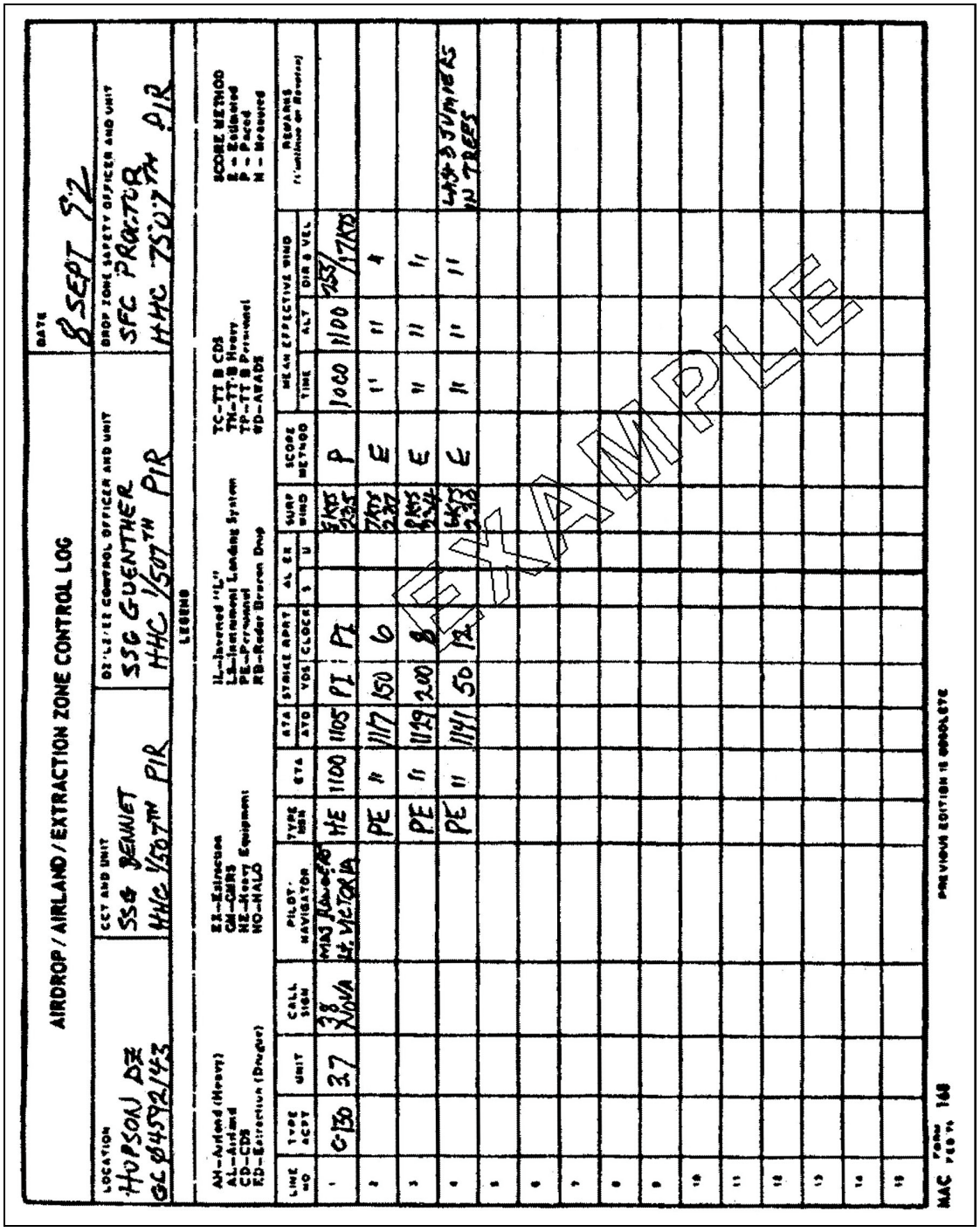
1. **DZ name or intended call sign.**
2. **Topographical map series and sheet number.**
3. **Recommended approach axis magnetic course.**
4. **Point of impact location** (Eight-digit grid).
5. **Leading edge centerline coordinates** (Eight digits).
6. **DZ size in meters or yards.**
7. **Air traffic restrictions or hazards.**
8. **Name of surveyor and unit assigned.**
9. **Recommendation for approval or disapproval.** (If disapproval, cite the reason.)
10. **Remarks.** (Include a recommendation for airdrop option, CARP, GMRS, VIRS, or blind drop.)

Figure 6-19. Tactical DZ assessment checklist.

TYPE DROP	AIRCRAFT	DAY or NIGHT	*POINT OF IMPACT
CDS	C-130	Day	At least 200 yards/183m
		Night	At least 250 yards/229m
	C-141/C-17	Day	At least 225 yards/206m
		Night	At least 275 yards/251m
Personnel	All USAF fixed-wing aircraft	Day	At least 300 yards/274m
		Night	At least 350 yards/320m
Heavy Equipment		Day	At least 500 yards/457m
		Night	At least 550 yards/503m

* Point of impact shown in distance from the leading edge of the drop zone and centerline.

Table 6-9. Favorable conditions for airdrops on tactically assessed DZs.



AIRDROP / AIRLAND / EXTRACTION ZONE CONTROL LOG

DATE: 8 SEPT 92

LOCATION: HUDSON DZ GC 044921/43

CCT AND UNIT: SSG BENNET HHC 1/507TH PIR

DZ/LZ/EE CONTROL OFFICER AND UNIT: SSG GUENTHER HHC 1/507TH PIR

DROP ZONE SAFETY OFFICER AND UNIT: SFC PRATOR HHC 1/507TH PIR

LEGEND

AM—Airland (Heavy)
AL—Airland
CD—CDS
ED—Extraction (Drogue)

EE—Emission
GM—GMRS
HE—Heavy Equipment
NO—HALO

IL—Inverted "L"
LS—Instrument Landing System
PE—Personnel
RB—Radar Beacon Drop

TC—TT B CDS
TH—TT B Heavy
TP—TT B Personnel
WD—ARADS

SCORE METHOD
E – Estimated
P – Paced
M – Measured

LINE NO	TYPE ACFT	UNIT	CALL SIGN	PILOT-NAVIGATOR	TYPE DROP	ETA	ATA	STRIKE APART YDS	STRIKE APART CLOCK	AL ER S	AL ER U	SURF WIND	SCORE METHOD	MEAN EFFECTIVE WIND TIME	MEAN EFFECTIVE WIND ALT	MEAN EFFECTIVE WIND DIR & VEL	REMARKS (Limitations or Reasons)
1	C130	37	38 NOVA	MAJ ROGERS 1st VICTORIA	HE	1100	1105	PI	PI			8 KTS 235	P	1000	1100	255/17KTS	
2					PE	"	1117	150	6			7 KTS 237	E	11	11	4	
3					PE	"	1119	200	8			8 KTS 234	E	11	11	11	
4					PE	"	1141	50	PI			6 KTS 236	E	11	11	11	LOST 3 JUMPERS IN TREES
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

EXAMPLE

MAC FORM 168 PREVIOUS EDITION IS OBSOLETE

Figure 6-20. Example completed AMC Form 168.